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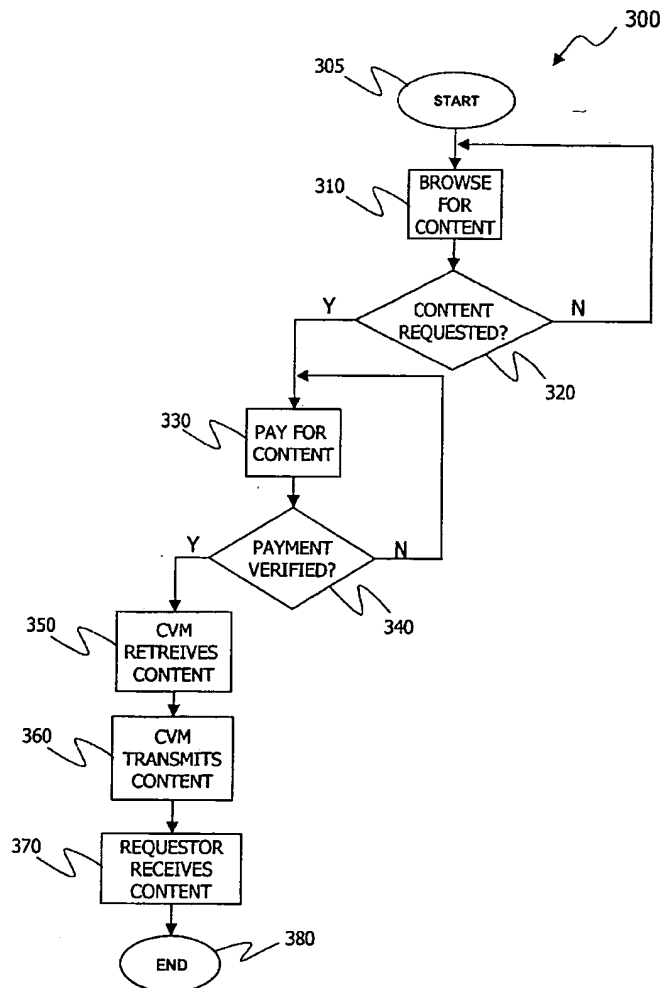
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US 20030033243A1

(19) **United States**(12) **Patent Application Publication** (10) Pub. No.: **US 2003/0033243 A1**
(43) Pub. Date: **Feb. 13, 2003**(54) **SYSTEM AND METHOD FOR WIRELESS
DELIVERY OF CONTENT OVER A
COMMUNICATIONS NETWORK****Publication Classification**(51) Int. Cl.⁷ **G06F 17/60**(52) U.S. Cl. **705/39**(76) Inventors: **Thomas W. Baker, Orefield, PA (US);
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RICHARDSON, TX 75083 (US)(21) Appl. No.: **09/924,100**(22) Filed: **Aug. 7, 2001**(57) **ABSTRACT**

A content vending machine, a method for wireless delivery of content and an information delivery system incorporating the machine or the method. In one embodiment, the content vending machine includes a request receiver associated with a request fulfiller. The request receiver receives payment information and a content request from a requestor. The request fulfiller verifies the payment information, retrieves content responsive to the content request and then wirelessly transmits the content to the requestor.



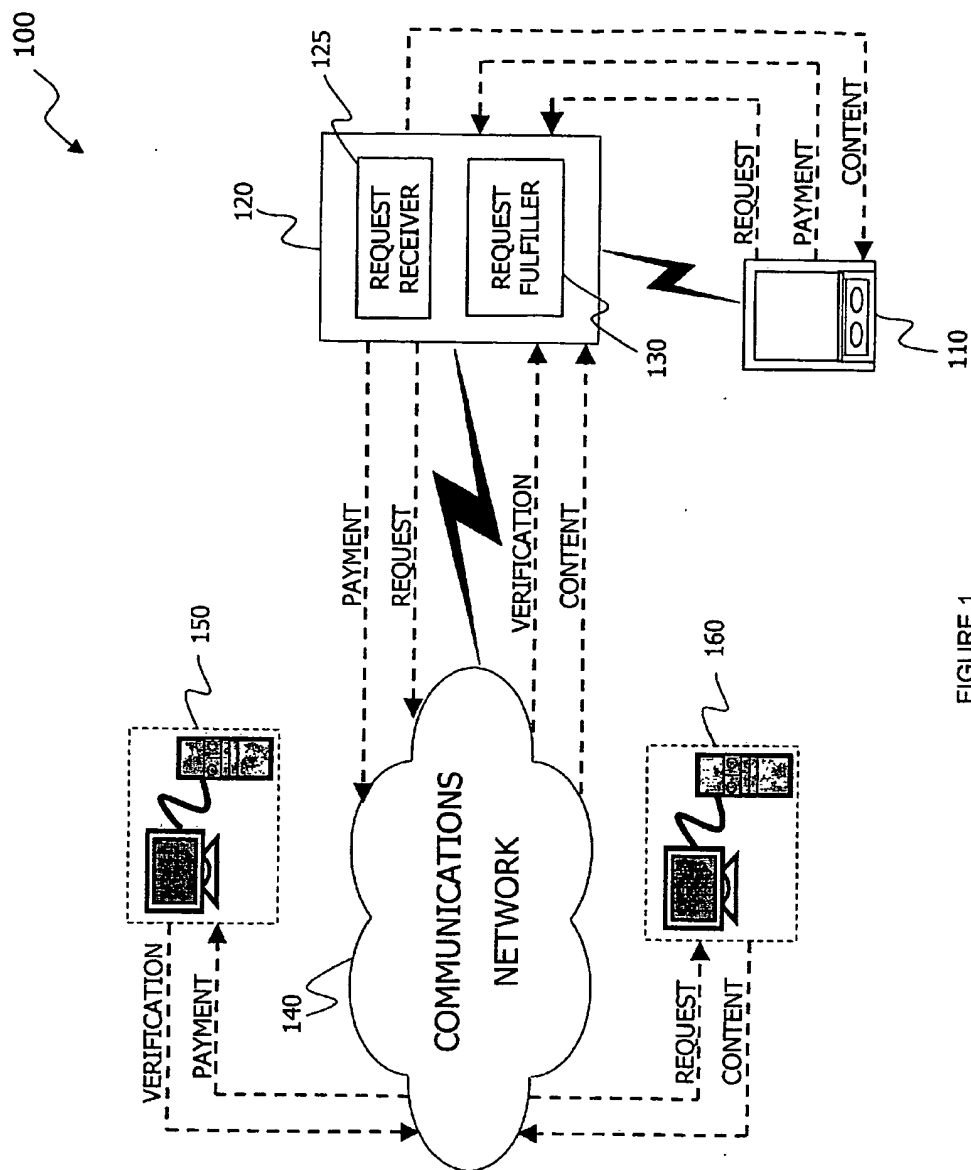


FIGURE 1

200

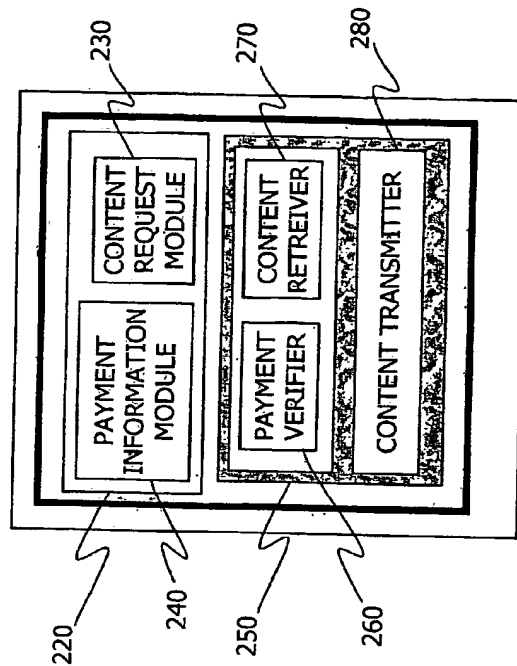


FIGURE 2

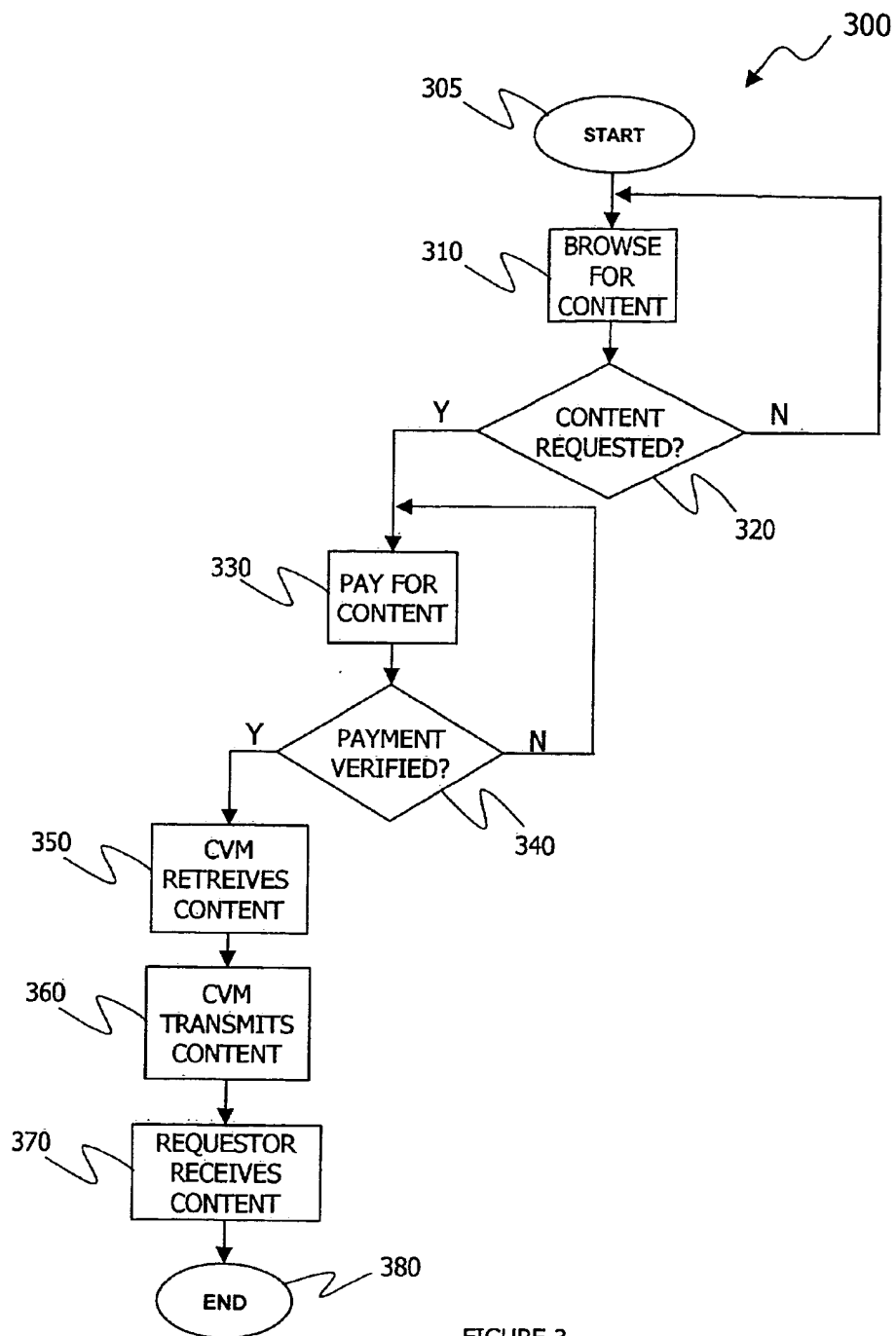


FIGURE 3

SYSTEM AND METHOD FOR WIRELESS DELIVERY OF CONTENT OVER A COMMUNICATIONS NETWORK

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention is directed, in general, to network infrastructure and, more specifically, to a system and method for wireless delivery of content and a information delivery system employing the same.

BACKGROUND OF THE INVENTION

[0002] The Internet provides an accessible medium for communication and the exchange of information and merchandise. In fact, consumers are now spending over three billion dollars a month for online purchases. Along with the purchasing of merchandise, other information based products are also being sought on the Internet.

[0003] One variety of products being obtained through the Internet includes digital data products that are easily distributed. For instance, digital data products including computer programs, videos and music are stored on computers and then e-mailed to Internet users. In addition, web sites are available to further distribute the digital information.

[0004] Besides being easily distributed, the copies are also of high quality. Thus, an owner of a digital data product can distribute high quality copies to many end users at minimal cost to the recipients. Though this allows more users the benefit of the products, this free distribution may also prevent copyright holders from positively receiving payment for their work. Copyright holders, therefore, are often reluctant to use the current distribution channels of digital data products, especially on the Internet.

[0005] To alleviate this problem, payment for some digital data products are requested on a voluntarily basis. Also, digital data can be distributed from a web site after a pre-determined amount of funds are received for the digital data product. This allows the distribution of digital data products over the Internet while also allowing copyright holders the opportunity to receive the benefit of royalties.

[0006] These distribution and payment systems, however, still do not typically afford a copyright holder a royalty for every copy that is distributed. Whether intentionally or not, all recipients of a freely distributed digital data product may not voluntarily pay. Also, further copying and distribution after receiving a preset amount of funds still may not allow a copyright holder a royalty for every copy generated.

[0007] Additionally, these distribution and payment systems often do not easily allow an end user the benefit of a digital data product even when payment is made. For example, the product must typically first be received through an Internet connected computer. The digital data product is then often loaded onto another device before a user can enjoy it. This usually requires a hardwired connection between the computer and other devices which limits the possible locations of receiving Internet digital data products.

[0008] Accordingly, what is needed in the art is a device that wirelessly delivers digital data that allows users access to and the use of the data while, at the same time, allowing the owners of such data to be compensated, if so desired.

SUMMARY OF THE INVENTION

[0009] To address the above-discussed deficiencies of the prior art, the present invention provides a content vending machine for wireless delivery of content. In one embodiment, the content vending machine includes a request receiver that receives payment information and a content request from a requester. The content vending machine also includes a request fulfiller, associated with the request receiver, that verifies the payment information, retrieves content responsive to the content request and then wirelessly transmits the content to the requester.

[0010] In another aspect, the present invention provides a method for wirelessly delivering content. In one embodiment, the method includes receiving payment information and a content request by a request receiver of a content vending machine from a requester and then verifying the payment information by a request fulfiller of the content vending machine that is associated with the request receiver. After verifying the payment information, the method further includes retrieving content responsive to the content request and then wirelessly transmitting the content to the requester.

[0011] In another aspect, the present invention provides an information delivery system for wireless delivery of content over a communications network that includes a content reservoir coupled to the communications network that stores content and a content vending machine, coupled to the content reservoir. The content vending machine includes a request receiver that receives payment information and a content request from a requester. The content vending machine also includes a request fulfiller, associated with the request receiver, that verifies the payment information, retrieves content responsive to the content request from the content reservoir and then wirelessly transmits the content to the requestor.

[0012] The foregoing has outlined, rather broadly, preferred and alternative features of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a more complete understanding of the present invention, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

[0014] FIG. 1 illustrates a network diagram of an embodiment of an information delivery system constructed in accordance with the principles of the present invention;

[0015] FIG. 2 illustrates a block diagram of an embodiment of a content vending machine constructed in accordance with the principles of the present invention; and

[0016] FIG. 3 illustrates a flow diagram of an embodiment of a method of wirelessly delivering content constructed in accordance with the principles of the present invention.

DETAILED DESCRIPTION

[0017] Referring initially to FIG. 1, illustrated is a network diagram of an embodiment of an information delivery system, generally designated 100, constructed in accordance with the principles of the present invention. The information delivery system 100 is coupled to a communications network 140 and includes a requester 110, a content vending machine 120, a remote payment verifier 150 and a content reservoir 160. The content vending machine 120 includes a request receiver 125 and a request fulfiller 130. In addition to the following discussion with respect to FIG. 1, both the request receiver 125 and the request fulfiller 130 are more fully discussed with respect to FIG. 2.

[0018] The requester 110 requests content from the request receiver 125 of the content vending machine 120. As shown in FIG. 1, the requester 110, may be wirelessly coupled to the content vending machine 120 wherein Bluetooth-compliant transceivers may be employed. In the illustrated embodiment, the Bluetooth-compliant transceivers are wirelessly coupled via a Bluetooth communications environment as defined in the Bluetooth Specification, Version 1.1 and incorporated herein by reference. A copy of the Bluetooth Specification, Version 1.1 can be obtained at <http://www.bluetooth.com/>. Alternative embodiments may wirelessly couple the requester 110 through conventional infra-red, radio frequency and other current or future wireless technologies.

[0019] After making a request, the requestor 110 also delivers payment information based on the request to the request receiver 125 of the content vending machine 120. As illustrated, the requester 110 may be a personal digital assistant (PDA). Those skilled in the pertinent art are familiar with PDAs, such as those commercially available from Palm™ by Palm Inc. of Santa Clara, Calif., Handspring™ by Handspring, Inc. of Mountain View, Calif. or other suppliers. Any PDA employed in the illustrated embodiment, however, should be equipped to operate in the Bluetooth environment as defined above or other wireless communications environment. Of course, other wireless or wireline devices fall within the broad scope of the present invention.

[0020] After receiving the payment information and content request from the requester 110, the request fulfiller 130 of the content vending machine 120 verifies that valid and correct payment information has been received. As illustrated, the content vending machine 120 may wirelessly transmit the payment information to the communications network 140. Alternatively, the content vending machine 120 may be wireline-coupled to the communications network 140. The present invention is not limited to a particular manner in which the content vending machine 120 may interact or communicate with the communications network 140 from which it derives the content.

[0021] The communications network 140, in the illustrated embodiment, may be any conventional network that supports respective communication between computers, telephony devices or other communications devices. The communications network 140 may be either wireless, hardwired or a combination of the two. In an exemplary embodiment, the communications network 140 may be the Internet. In an alternative embodiment, the communications network 140 may be an Intranet of a business. One skilled in the

pertinent art also understands that the communications network 140 may employ communications between any number of content vending machines 120, remote payment verifiers 150 or content reservoirs 160.

[0022] In the illustrated embodiment, payment information is verified by the remote payment verifier 150 once it is received through the communications network 140. In alternative embodiments, payment information verification may be performed locally at the content vending machine 120. Remote payment information verification is well known in the art and may include any one of a number of conventional electronic payment systems. For a survey of currently available electronic payment systems, see "Electronic Payment Systems" by Donal O'Mahony, Michael Peirce, and Hitesh Tewari, Artech House (1997), which is incorporated herein by reference.

[0023] As shown in FIG. 1, once the payment information is verified, verification is sent via the communications network 140 to the request fulfiller 130 of the content vending machine 120. After receiving the payment information verification, the request fulfiller 130 of the content vending machine 120 then retrieves the requested content by sending a request for the requested content via the communications network 140 to the content reservoir 160. Upon receipt of the request, the content reservoir 160, sends the requested content over the communications network 140 to the request fulfiller 130 of the content vending machine 120 which subsequently transmits the content to the requester 110 through a wireless connection. In an exemplary embodiment, the content may be wirelessly transmitted via a Bluetooth-compliant transmitter.

[0024] In FIG. 1, the content reservoir 160 is a conventional computer capable of receiving, storing and delivering content through a connection to the communications network 140. In alternative embodiments, the content reservoir 160 may be a dedicated device that is constructed of special-purpose hardware employing a software program, which directs its operation.

[0025] Turning now to FIG. 2, illustrated is a block diagram of an embodiment of a content vending machine, generally designated 200, constructed in accordance with the principles of the present invention. The content vending machine 200 includes a request receiver 220 and a request fulfiller 250. It should be noted that other components not shown may be included within the content vending machine 200 without departing from the scope of the present invention. The content vending machine 200, in the illustrated embodiment, is a dedicated device that is constructed of special-purpose hardware employing a software program, which directs its operation. Other embodiments, of course, may employ a device that is solely hardwired or that is solely software enabled using general purpose hardware such as a computer.

[0026] As shown in FIG. 2, the request receiver 220 includes a content request module 230 and a payment information module 240. The content request module 230 receives requests for content selected from the content vending machine 200. In an exemplary embodiment, the requests may be received from a wirelessly coupled requester similar to the requester 110 illustrated in FIG. 1. As discussed above, the requester 110 may be wirelessly coupled to the content vending machine 200 through any

conventional technology including Bluetooth, infra-red and radio frequency. In other embodiments, however, the content request module 230 may receive the request through physical interaction with the content vending machine 200. For example, one may select the requested content via a touch screen, push buttons, or any other conventional means of selection.

[0027] The payment information module 240 is coupled to the content request module 230. The payment information module 240 determines payment amount and receives payment information. In one embodiment, the payment amount is determined based on the number of items requested. Alternative embodiments, however, may determine the payment amount based on the total size of the request. Anyone skilled in the art will understand that the payment criteria may be determined as desired and may be updated remotely through a connection to a communications network. In one embodiment, the connection to the communications network may be wireless. In other embodiments, the connection to the communications network may be hardwired.

[0028] The payment information module 240 may receive the payment information in a variety of ways. In one embodiment, payment information may be delivered by a customer directly depositing the correct currency into the content vending machine 200. In the illustrated embodiment, payment information verification is located internal to the content vending machine 200. Alternative embodiments may accept payment information by way of an optical or magnetic reader, such as is conventionally employed to read credit cards or debit cards. In an exemplary embodiment, payment information may be completed by any of the methods discussed above or other conventionally known or future-developed payment methods. One skilled in the pertinent art will understand the well known operation of a vending machine receiving and verifying payment information for the delivery of a tangible object.

[0029] Associated with the request receiver 220 is the request fulfiller 250. As illustrated, the request fulfiller 250 includes a payment verifier 260, a content retriever 270 and a content transmitter 280. The payment verifier 260 receives verification that a valid payment has been offered. If cash is used, then the content vending machine 200 will verify the payment information locally. In other embodiments, the payment verifier 260 may contact a remote payment verifier 150 as shown and discussed with respect to FIG. 1.

[0030] The content retriever 270 retrieves the requested content after receiving verification from the payment verifier 260. In an exemplary embodiment, the content retriever 270 may retrieve the requested content from information directly stored in the content vending machine 200. In alternative embodiments, the content retriever 270 may send a request for content to the content reservoir 160 via the communications network as previously discussed with respect to FIG. 1.

[0031] Upon receipt of the content, the content transmitter 280 wirelessly transmits the content from the content vending machine 200 to a requestor such as the requestor 110 shown in FIG. 1. As discussed above, the requestor may be wirelessly coupled to the content vending machine 200 through any conventional technology including Bluetooth, infra-red and radio frequency. In some embodiments, the content retriever 270 and the content transmitter 280 may be combined into one transceiver that performs both functions.

[0032] Turning now to FIG. 3, illustrated is a flow diagram of an embodiment of a method, generally designated 300, of wirelessly delivering content, constructed in accordance with the principles of the present invention. The method 300 starts in a step 305 with an intent to browse and possibly purchase content from a content vending machine (represented by CVM in FIG. 3).

[0033] After starting, a potential customer browses for content on a content vending machine in a step 310. In one embodiment, the customer may browse for content through a requestor. In alternative embodiments, the customer may browse via a touch screen or buttons located on the content vending machine.

[0034] In one embodiment of the present invention, the content is selected from a group consisting of computer data, audio data and video data. Those skilled in the pertinent art will understand that the present invention is not limited to fulfillment of any particular type of data, and is advantageously adapted to dispense copy-sensitive data, such as copyrighted music, video, or other forms of information. To address the copy-sensitivity of the data, the data may be copy-limited.

[0035] After browsing for content, a determination is made to either request content or not request content in a first decisional step 320. As previously discussed, a request for content may be performed through a requestor or by physical interaction with the content vending machine.

[0036] If it is determined that content has been requested, then payment information for the content is rendered in a step 330. In one embodiment, payment information is rendered by conventionally depositing the correct amount of cash into the content vending machine. Alternatively, if the content vending machine is connected to a communications network, then the payment information may be rendered by credit card, debit card, electronic funds transfer, or any other acceptable means of rendering payment.

[0037] A determination is then made if payment information is verified in a second decisional step 340. In an exemplary embodiment, payment information verification is completed locally at the content vending machine. In other embodiments, payment information is verified remotely from the content vending machine through a communications network.

[0038] Upon verification of the payment information, the content vending machine retrieves the requested content in a step 350. In an exemplary embodiment, the content may be stored locally and retrieved directly from the content vending machine. In an alternative embodiment, the content may be retrieved from a content reservoir via the communications network.

[0039] After receiving the content, the content vending machine transmits the content in a step 360. As discussed, the content vending machine may wirelessly transmit the content to a requestor in several ways. In one embodiment, the requestor may be a laptop computer. In an alternative embodiment, the requestor may be a digital camera or a MP3 player. One skilled in the pertinent art will know that a requestor may be any device capable of receiving electronic information.

[0040] Once the content vending machine transmits the content, a requestor receives the content in a step 370. The

requester may receive the content through any wireless method including those already mentioned. Finally, the wireless delivery of content ends in a step 380.

[0041] Returning now to the first decisional step 320, if content is not requested, then the method 300 returns to the step 310 wherein browsing for content continues. If payment information is not verified in the second decisional step 340, then the method 300 returns to the step 330.

[0042] Although the present invention has been described in detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

What is claimed is:

1. A content vending machine for wireless delivery of content, comprising:

a request receiver configured to receive payment information and a content request from a requester; and

a request fulfiller, associated with said request receiver, configured to verify said payment information, retrieve content responsive to said content request and wirelessly transmit said content to said requester.

2. The content vending machine as recited in claim 1 wherein said payment information is configured to be wirelessly received from said requester.

3. The content vending machine as recited in claim 1 wherein said content request is configured to be wirelessly received from said requester.

4. The content vending machine as recited in claim 1 wherein said requester is a personal digital assistant.

5. The content vending machine as recited in claim 1 wherein said content is selected from the group consisting of:

computer data,

audio data, and

video data.

6. The content vending machine as recited in claim 1 wherein said request fulfiller comprises a Bluetooth-compliant transmitter configured to wirelessly transmit said content to said requester.

7. The content vending machine as recited in claim 1 wherein said content vending machine is coupled to a communications network.

8. A method for wirelessly delivering content, comprising:

receiving payment information and a content request by a request receiver of a content vending machine from a requester;

verifying said payment information by a request fulfiller, associated with said request receiver, of said content vending machine;

retrieving content responsive to said content request; and wirelessly transmitting said content to said requester.

9. The method as recited in claim 8 wherein said payment information is wirelessly received from said requester.

10. The method as recited in claim 8 wherein said content request is wirelessly received from said requester.

11. The method as recited in claim 8 wherein said requester is a personal digital assistant.

12. The method as recited in claim 8 wherein said content is selected from the group consisting of:

computer data,

audio data, and

video data.

13. The method as recited in claim 8 wherein said wirelessly transmitting is performed by a Bluetooth-compliant transmitter.

14. The method as recited in claim 8 wherein said content vending machine is coupled to a communications network.

15. An information delivery system for wireless delivery of content over a communications network, comprising:

a content reservoir coupled to said communications network that stores content; and

a content vending machine, coupled to said content reservoir, including:

a request receiver that receives payment information and a content request from a requester; and

a request fulfiller, associated with said request receiver, that verifies said payment information, retrieves content responsive to said content request from said content reservoir and wirelessly transmits said content to said requester.

16. The information delivery system as recited in claim 15 wherein said payment information is wirelessly received from said requester.

17. The information delivery system as recited in claim 15 wherein said content request is wirelessly received from said requester.

18. The information delivery system as recited in claim 15 wherein said requester is a personal digital assistant.

19. The information delivery system as recited in claim 15 wherein said content is selected from the group consisting of:

computer data,

audio data, and

video data.

20. The information delivery system as recited in claim 15 wherein said request fulfiller comprises a Bluetooth-compliant transmitter that wirelessly transmits said content to said requester.

21. The information delivery system as recited in claim 15 wherein said content vending machine is wirelessly coupled to said communications network.

* * * * *



US005267171A

United States Patent [19][11] **Patent Number:** **5,267,171****Suzuki et al.**[45] **Date of Patent:** **Nov. 30, 1993****[54] COMPUTER SOFTWARE VENDING MACHINE****[75] Inventors:** Takamitsu Suzuki, Nagoya; Yasuyo Mori, Yokkaichi, both of Japan**[73] Assignee:** Brother Kogyo Kabushiki Kaisha, Nagoya, Japan**[21] Appl. No.:** 671,473**[22] Filed:** Mar. 19, 1991**[30] Foreign Application Priority Data**

Mar. 29, 1990 [JP] Japan 2-35177[U]

Mar. 29, 1990 [JP] Japan 2-35178[U]

[51] Int. Cl.⁵ G06F 15/21**[52] U.S. Cl.** 364/479; 364/401**[58] Field of Search** 364/479, 401, 403, 410, 364/518, 155; 235/375, 380, 381**[56] References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—Jerry Smith**Assistant Examiner**—Paul Gordon**Attorney, Agent, or Firm**—Oliff & Berridge**[57] ABSTRACT**

A computer software vending machine includes an information storage unit for storing user information relating to a particular user when the user utilizes the computer software vending machine. An information reading unit reads various information from the information storage unit. The storing unit stores a plurality of computer software and user information relating to the user when the user utilizes the computer software vending machine. A comparing unit compares the user information stored in the storing unit with the user information relating to the user when the user utilizes the computer software vending machine. A selecting unit selects computer software which has been supplied from the computer software vending machine after the user last utilized the computer software vending machine from the information storage unit, on the basis of the comparison with the comparing unit. The displaying unit displays the computer software selected by the selecting unit.

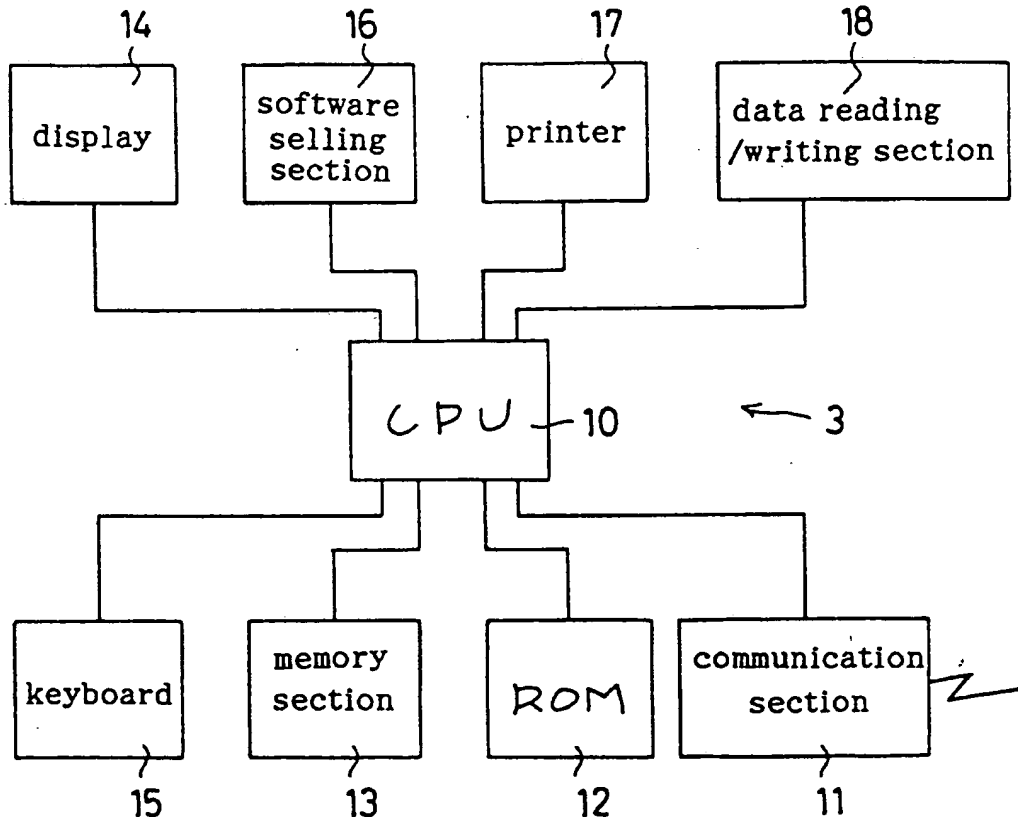
9 Claims, 8 Drawing Sheets

Fig.1

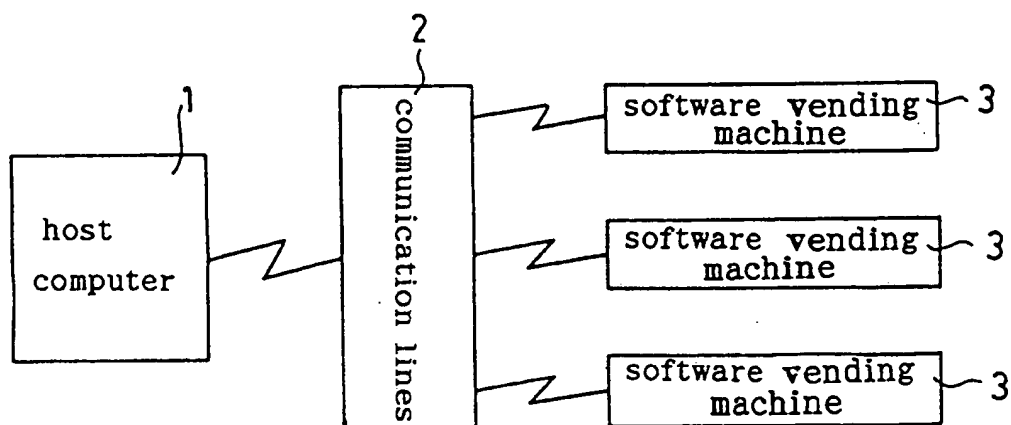


Fig.2

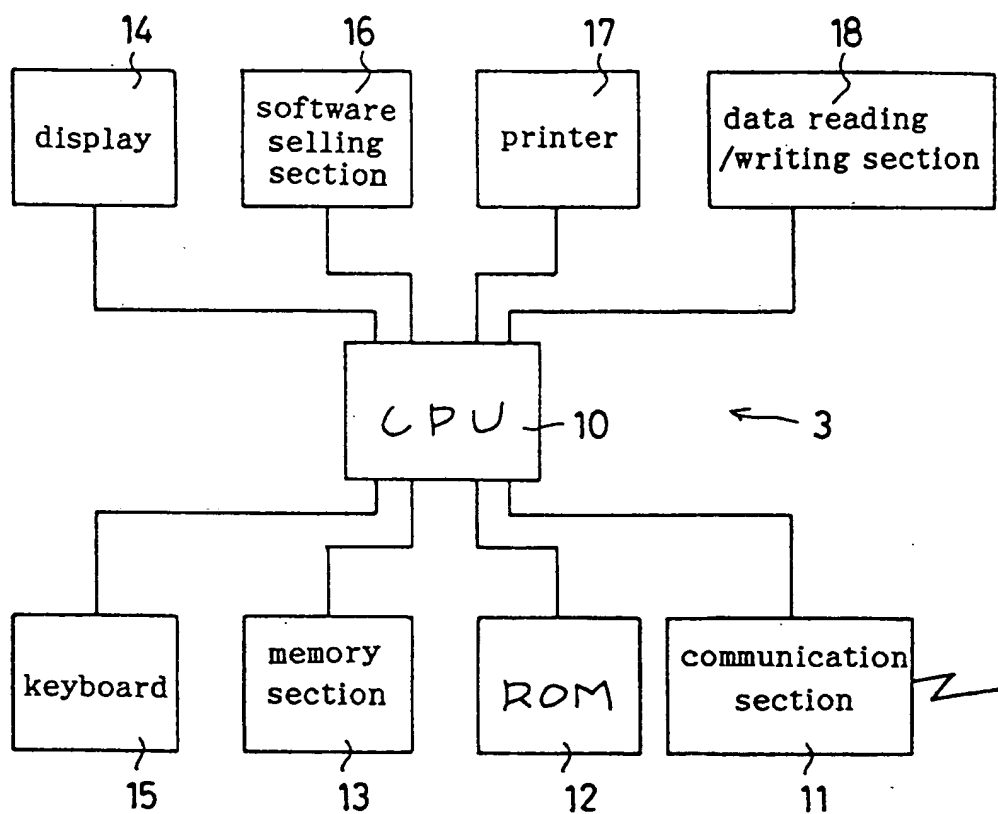


Fig.3

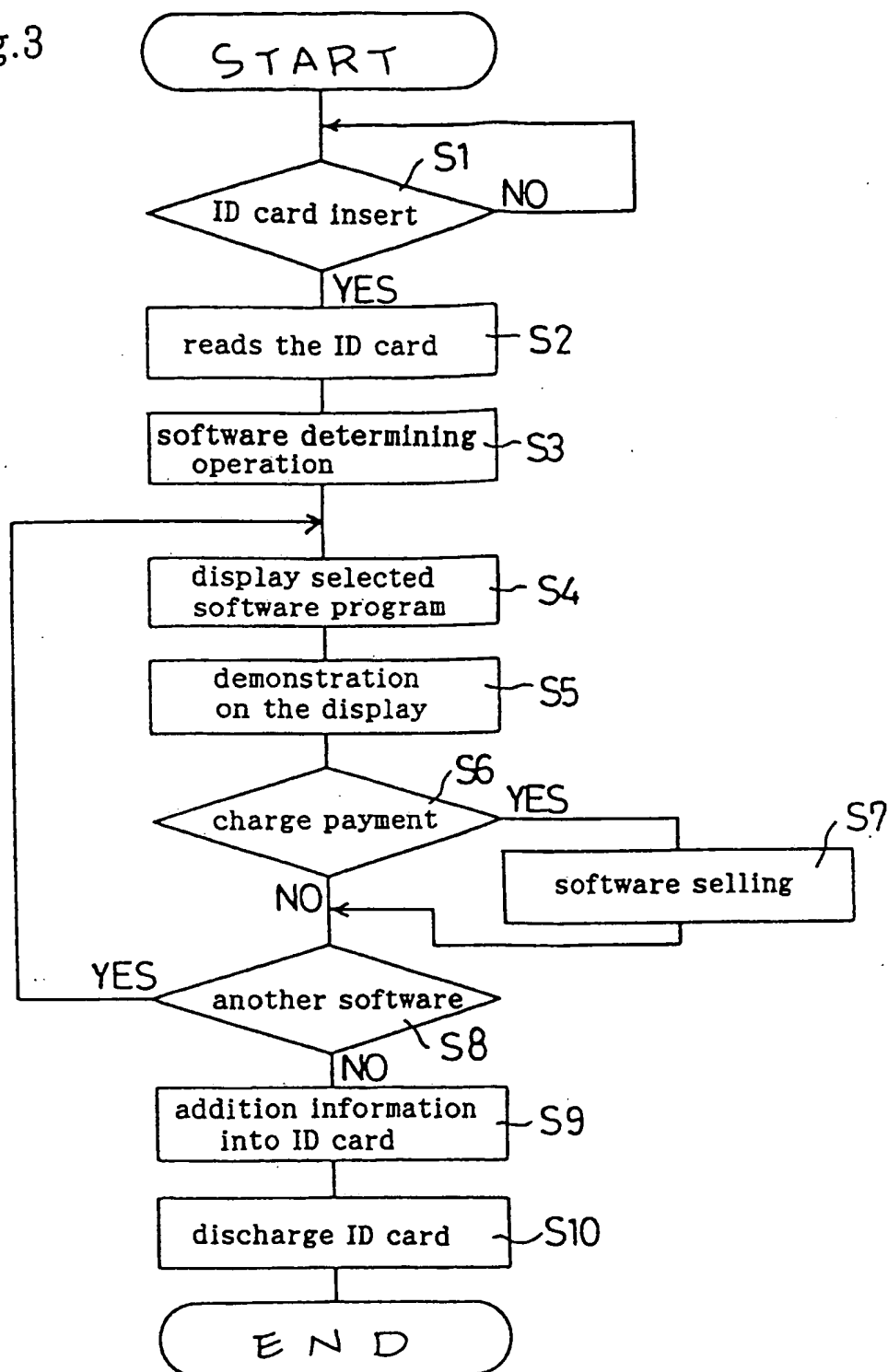


Fig.4

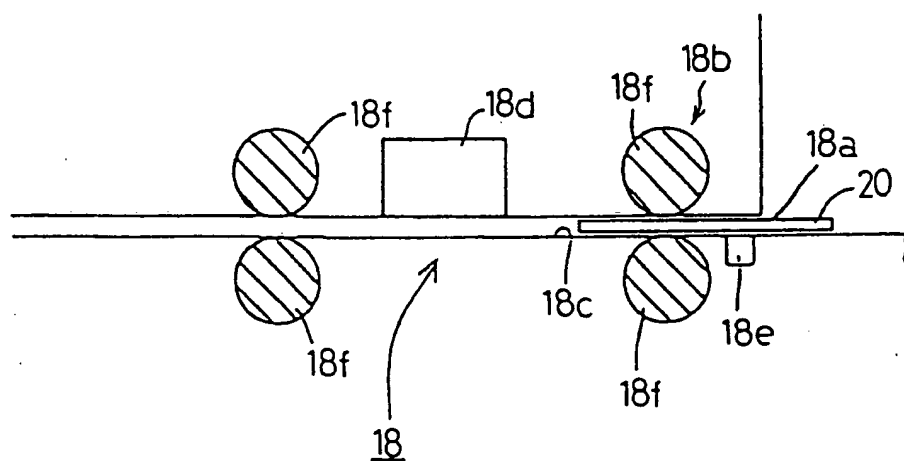


Fig.5(a)

identity code K	category code J	Model designating code M	registration code D
1	A	ZZ	89, 1, 10
2	B	XX, ZZ	89, 7, 1
3	A	YY	88, 12, 1
4	C	XX, ZZ	90, 6, 1
5	A	YY, ZZ	89, 11, 1
6	B	XX	90, 6, 1
7	C	YY	90, 4, 1
.
.
.
N	A	XX	89, 11, 1

Fig.5(b)

NAME:	TOM	,	ID
MODEL:	XX		IM
UTILIZED HISTORY:			
DATE:			
88,01,20	88,05,29	89,03,14	
89,09,28	90,04,25	90,05,28	
			LU
PURCHASED HISTORY:			
DATE:		CATEGORY:	
88,05,29 ;	A	:	
90,04,25 ;	C	:	
	LV		IJ

Fig.6

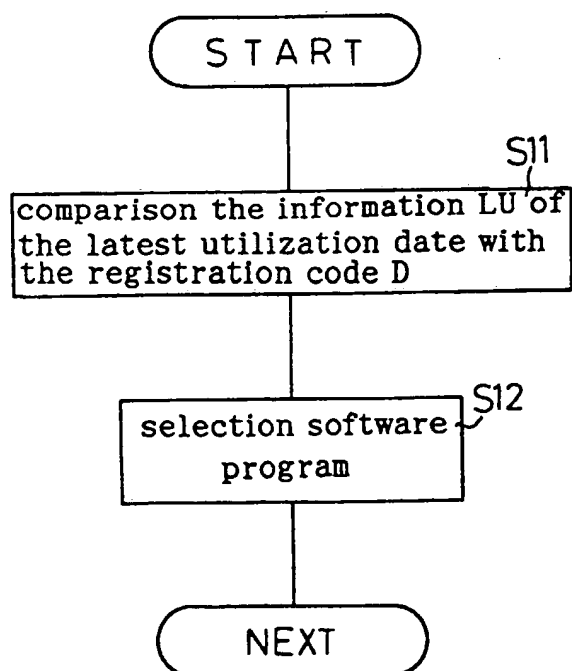
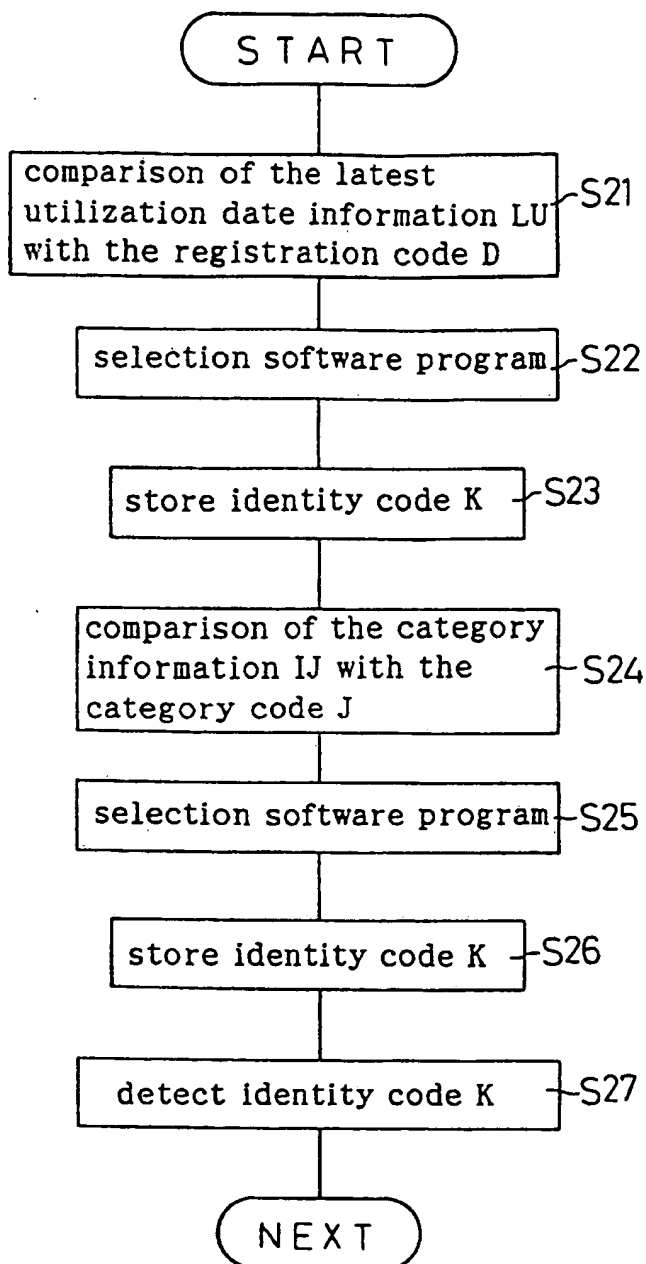


Fig.7



COMPUTER SOFTWARE VENDING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a vending machine for computer software, and more particularly to a computer software vending machine which provides a computer software display in accordance with the user's known preferences and the user's use history.

2. Discussion of the Related Art

Computer software vending machines and a managing apparatus for managing the computer software vending machines of these types are known, for example as in U.S. Pat. Nos. 4,787,050, and 4,677,565.

In these types of computer software vending machines, each user who wants to purchase computer software is required to select computer software which suits the user's liking from among a large number of candidates of computer software.

A great deal of time is, however, required before the user selects and buys computer software meeting his liking, since such vending machines necessarily have a plurality of computer software from which to choose to satisfy the requirements of a variety of users with differing use histories.

For this reason, the users are often dissatisfied with such conventional vending machines.

OBJECTS AND SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to overcome the above-described drawbacks and disadvantages by providing a computer software vending machine which provides computer software according to a user's known preferences and a user's use history.

Another object of the present invention is to provide a computer software vending machine which permits shortening of the time required for each user to select and buy computer software.

A further object of the present invention is to provide a computer software vending machine capable of tailoring newly-received software in accordance with each user.

According to the present invention, there is provided a computer software vending machine which comprises: information inputting means for inputting user information relating to the user; storing means for storing a plurality of computer software and user information relating to the user, the computer software being related to the user information; comparing means for comparing the user information stored in the storing means with the user information input by the information inputting means; selecting means for selecting computer software on the basis of the comparison with the comparing means; and display means for displaying the selected computer software selected by the selecting means.

According to the present invention, the information inputting means inputs user information relating to the user. The comparing means compares the user's information stored in the storing means with the user information relating to the user input by the information inputting means. The selecting means selects computer software on the basis of the comparison with the comparing means. Next, the display means displays the computer software selected by the selecting means.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features and advantages of the present invention will become more apparent by reading the following detailed description of presently preferred embodiments of the present invention, when considered in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram showing the construction of a computer software vending system according to an embodiment of the present invention;

FIG. 2 is a block diagram of a computer software vending machine;

FIG. 3 is a main flowchart showing the operation of the computer software vending machine;

FIG. 4 is a sectional view of a reader section for reading users' cards in the computer software vending machine;

FIG. 5(a) is a diagram showing an exemplary table for the management of computer software stored in the computer software vending machine;

FIG. 5(b) is a schematic diagram showing a card and the data stored therein;

FIG. 6 is a flow chart illustrating a managing procedure of software programs stored in memory in the vending machine according to the present invention; and

FIG. 7 is a flow chart illustrating a managing procedure of software programs stored in memory in the vending machine according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and particularly to FIGS. 1-6 thereof, one preferred embodiment of the present invention will be described.

As shown in FIG. 1, computer software vending machines 3 mounted in retail stores throughout the country are connected to a host computer 1 through communication lines 2, so that the host computer 1 can supply computer software (hereinafter referred to as "software") to the software vending machines through the communication lines 2.

As shown in FIG. 2, the interior of each software vending machine 3 is provided with a CPU (central processing unit) 10. The CPU 10 is connected to a communication section 11 which is in turn connected to the host computer 1 through a communication line 2 and a ROM (read-only memory) 12 which stores a control program for controlling the CPU 10. The software vending machine 3 includes a memory section 13 which stores not only various software programs and manual data but also stores display programs for instructions on using the software vending machine 3 and display programs for operating procedures. The memory section 13 also stores programs for demonstration of each software. The software vending machine 3 also includes a display 14 for displaying various software demonstrations, instructions for using the software vending machine 3, and procedures for operating the software vending machine 3. The software vending machine 3 also includes a keyboard 15 to be used by each user to select a software or to input information indicating whether the user wants to select and buy the software, a software selling section 16 for selling computer software, and a printer 17 for printing a software manual as shown in U.S. Pat. No. 4,677,565.

As shown in FIG. 5(a), the memory section 13 stores identity code K which identifies a software program, category code J which indicates a category of software programs, model designating code M which indicates the designated models of microcomputers which can be executed by the software programs, registration code D which indicates the registration day, i.e., the day when software programs are supplied from the host computer 1 through the communication line 2, as well as software programs.

The software vending machine 3 is further provided with a data reading/writing section 18 which not only performs the insertion and discharge of an ID (identification) card 20 which serves as an information storage means storing data indicative of the date when the user having the ID card 20 last utilized the software vending machine 3, but also reads various data from the ID card 20 and writes data thereon.

The card 20 stores information LU relating to the latest utilization date when the user utilized the software vending machine 3, information LV relating to the day when the user purchased software programs from the software vending machine 3, identity information ID identifying the user, category information U indicating the category of software programs purchased by the user from the vending machine 3, and information IM indicating the designated models of microcomputers which can execute the software programs as shown in FIG. 5(b). The card 20 includes magnetic storage tape (not shown) embedded in the body such as that usually used in a cash card or the like.

As shown in FIG. 4, the information reading/writing device 18 has a card inlet/outlet port 18a, a card feeder 18b coupled with the inlet/outlet port 18a for feeding the ID card 20 into the inside of the vending machine 3, a card path 18c provided with the card feeder 18b through which the card 20 passes, an information reading/writing portion 18d installed at the card path 18c for reading or writing the information in the magnetic storage tape of the card 20. The card feeder 18b comprises a sensor 18e installed in the vicinity of the card inlet/outlet port 18a along the card path 18c for detecting the presence of the card 20 and a plurality of rollers 18f arranged along the card path 18c for feeding the card 20 based on the detection of the sensor 18e. When the ID card 20 is inserted into the inlet/outlet port 18a by a user, the sensor 18e detects the presence of the card 20.

The rollers 18f are thereafter rotated, and the card 20 is conveyed along the card path 18c to the inside of the apparatus. The information reading/writing portion 18d reads information in the magnetic storage tape of the card 20, transmits it to the CPU 10 and also writes information from the CPU 10. The data reading/writing section 18 serves as both an information reading means and an information writing/rewriting means. The CPU 10 and the ROM 12 constitute a comparing means and selecting means.

New software fed from the host computer 1 through the communication line 2 is received by the communication section 11, and the CPU 10 writes a program of this software, together with its received date, from the communication section 11 into an empty capacity portion in the memory section 13. In the event there is no empty capacity in the memory section 13, the CPU 10 superscribes a program of the newly-received software in an unpopular software storing portion together with its received date, as shown in U.S. Pat. No. 4,787,050.

The operation of the software vending machine 3 of this embodiment will now be described below with reference to FIGS. 1 to 6.

Initially, as shown in FIG. 3, when the user is to operate the software vending machine 3, the CPU 10 instructs the user to insert his ID card 20 into a card inlet/outlet port 18a of the data reading/writing section 18.

This instruction is given in the form of a display on the display 14. This instruction state is repeated until the ID card is inserted into the card inlet/outlet port 18a (step 1, hereinafter indicated simply by S1, and following steps are indicated in a like manner). The user inserts his ID card 20 into the card inlet/outlet port 18a of the data reading/writing section 18. After the CPU 10 checks whether the ID card 20 has been inserted into the card inlet/outlet port 18a or not, and if the answer is affirmative, the CPU 10 causes the data reading/writing section 18 to read from the ID card 20 the information LU of the latest utilization date when the user utilized the software vending machine 3 with the ID card 20 (S2).

From the information LU of the latest utilization date by the user read by the data reading/writing section 18, the CPU 10 determines which software has not yet been reviewed by the user, and retrieves the software from the memory section 13 on the basis of this determination (S3).

Now, the determination operation in S3 executed by the CPU 10 will be described below with reference to FIG. 6.

The CPU 10 compares the information LU of the latest utilization date when the user utilized the software vending machine 3 with the registration code D, as shown in FIG. 5, which indicates the registration day when software programs are supplied from the host computer 1 (S11). The CPU 10 selects software programs which have been supplied from the host computer 1 after the user last utilized the vending machine 3 (S12).

The CPU 10 reads the identity codes K for identifying software programs from the memory section 13. The software thus read by the CPU 10 from the memory section 13 is displayed on the display 14 (S4).

The user selects software suiting his or her liking from among the software displayed on the display 14 and inputs the selected software using the keyboard 15, causing the CPU 10 to read programs for the demonstration of that software from the memory section 13 and display it on the display 14 (S5). When the user wants to purchase this software, the user provides input indicative thereof using the keyboard 15 and pays for the software using a charge payment port (not shown) of the software vending machine 3 (S6: Yes).

The CPU 10 causes the software selling section 16 to write a program of the software purchased by the user onto a floppy disc provided in the software vending machine 3. Thereafter, the floppy disc is discharged to the exterior of the software vending machine 3 from a discharge port (not shown) of the software selling section 16. The CPU 10 causes the printer 17 to print a manual of the software and discharge the manual from a discharge port (not shown) of the printer 17 (S7).

In the case where the user does not want to purchase the software displayed on the display 14, the user provides input indicative thereof using the keyboard 15 (S6: No). After the software vending machine 3 completes the sale of the software, or when the user does not

purchase the software displayed on the display 14, the CPU 10 inquires through the display 14, whether the user desires to select other software. When the user answers affirmatively using the keyboard 15 (S8: Yes), execution returns to S4 described above and the user is again able to select software from a plurality of software read from the memory section 13 by the CPU 10 and displayed on the display 14.

When the user answers negatively using the keyboard 15 (S8: No), the CPU 10 adds the information LU of this utilization date of the user to the inserted ID card 20 using the data reading/writing section 18 (S9). After the CPU 10 causes the data reading/writing section 18 to write the information LU of this utilization date of the user, the CPU 10 causes the rollers 18f to discharge the ID card 20 from input/output port 18a (S10).

According to the present embodiment as set forth above, since computer software which has not yet been reviewed by each user is displayed on the basis of the information of the latest utilization date of the user, it is possible to provide a computer software vending machine capable of tailoring newly-received computer software for each user. This provides an outstanding advantage from the commercial standpoint.

Although in this embodiment the information of the latest utilization date of each user is stored in the ID card 20, there may be adopted a construction in which only the data for the identification of each user is stored in the ID card 20, and when the ID card 20 is inserted into the software vending machine 3, the CPU 10 reads the information LU of the latest utilization date of the user from an information storing memory which is provided within the software vending machine 3 and which stores the latest utilization dates of the users of the software vending machine 3. On the basis of the information thus read, the CPU 10 can select from the memory section 13 software which has not yet been reviewed by the user.

A second embodiment will now be described hereinafter.

In this embodiment, like parts and components are utilized as those used in FIGS. 1-5(b). Only the determination operation executed by the CPU 10, as shown in FIG. 3, is different from the determination operation described in conjunction with the first embodiment.

Accordingly, only the determination operation executed by the CPU 10 will be described below with reference to FIG. 7.

The CPU 10 compares the latest utilization information LU when the user last utilized the software vending machine 3 with the registration code D, as shown in FIG. 7 which indicates the registration day when software programs are supplied from the host computer 1 (S21). The CPU 10 selects only computer software programs which have been supplied from the host computer 1 after the user last utilized the vending machine 3 (S22).

The CPU 10 stores the identity codes K corresponding to the software programs selected in S22 in the memory section 13 (S23).

The CPU 10 compares the category information IJ indicating the category of the software programs last purchased by the user with the software vending machine 3 with the category code J as shown in FIG. 5(a) (S24). The CPU 10 selects software programs which yield the category obtained from the S24 comparison (S25). The CPU 10 stores the identity codes K corresponding to the software programs selected in S25 in

the memory section 13 (S26). The CPU 10 reads the identity codes K which are stored in the memory section 13 in S23 and S26 and detects the identity codes K which are commonly selected in S23 and S26 (S27).

As shown in FIG. 5(a), the memory 13 stores identity code K, category code J, and registration code D. The card 20 stores, as shown in FIG. 5(b), the latest utilization date information LU and the category information IJ. The CPU 10 compares the latest utilization date information LU with the registration code D (S21) and selects software programs which are supplied from the host computer 1 after the user last utilized the vending machine 3 (S22). For example, the latest utilization date LU read from card 20 is 90, 05, 28, and identity codes 4 and 6 of software programs were supplied from the host computer 1 on 90, 6, 1 (after the latest utilization date LU of 90, 05, 28) as shown in FIG. 5(a). Accordingly, the CPU 10 selects identity codes 4 and 6 and stores the identity codes 4 and 6 into the memory section 13 (S23).

The CPU 10 then compares the category information IJ with the category code J (S24) and selects software programs which agree in category (S25). The category information IJ read from card 20 yields category C. As shown in FIG. 5(a), codes 4 and 7 of software programs correspond to category C. Accordingly, the CPU 10 selects identity codes 4 and 7 and stores the identity codes 4 and 7 into the memory section 13 (S26). The CPU 10 finally selects the identity code 4 stored in the memory section 13 which was commonly selected in both Steps S23 and S26.

According to the second embodiment as set forth above, since computer software which has not yet been reviewed by each user is displayed by the software vending machine 3 on the basis of the information of the latest utilization date of the user and the category information IJ indicating the category of the software programs purchased by the user, it is possible to provide a computer software vending machine which permits shortening of the time required for each user to select and purchase computer software and which is capable of tailoring newly-received computer software for each user.

Although in this embodiment the information related to software bought previously by each user is stored in the user's ID card 20, there may be adopted a construction wherein only the data for the identification of each user is stored in the user's ID card 20, and upon insertion of the ID card into the software vending machine 3, the CPU 10 reads the information related to software which the user has bought previously, from an information storage means which is provided within the software vending machine 3 and which stores the information related to the software bought previously by the users of the software vending machine 3. Then, on the basis of the information thus read, the CPU 10 can select from the memory section 13 software which best suits the user's liking based on his previous purchases. As another embodiment, the information storage means may be provided within the host computer.

Further embodiments of the above-described system can be provided. For example, when the user wants to also see software which was available prior to his latest utilization date, the software retrieval range may be widened in reply to an input indicative thereof from the keyboard 15.

In another example, the type of a computer which the user possesses may be stored in his or her ID card, and

software not employable in that type of computer may be inhibited from display.

Software can be classified into software used for business, software used for education and software used for recreation. As to the kinds of software used for recreation, such kinds include action, characters, role playing, and simulation. Each software classification involves a more minute classification thereof.

When the user inserts his or her ID card 20 into the card inlet of the data reading/writing section 18, the CPU 10 could check whether the ID card 20 has been inserted into the card inlet, and if the answer is affirmative, the CPU 10 could cause the data reading/writing section 18 to read from the ID card such information as the titles and kinds of the software which the user has bought previously.

Furthermore, there could be adopted a construction wherein the model designating code IM of each user's model is stored in the user's ID card 20, and upon insertion of the ID card 20 into the software vending machine 3, the CPU 10 reads the model designating code IM from the user's ID card 20. Then, on the basis of the information thus read, the CPU 10 selects from the memory section 13 software which best suits the user's model based on the model designating code.

Furthermore, as shown in FIG. 5(a), the memory 13 may store identity code K, category code J, model designating code M and registration code D. The card 20 stores, as shown in FIG. 5(b), the latest utilization date information LU, the model designating code IM and the category information IJ. The CPU 10 compares the latest utilization date information LU with the registration code D and selects software programs which are supplied from the host computer 1 after the user last utilized the vending machine 3. The CPU 10 compares the category information IJ with the category code J and selects software programs which agree in category. The CPU 10 compares the model designating code IM with the model designating code M and selects software programs which agree in model. The CPU 10 selects computer software which is commonly obtained in the above three comparisons.

While this invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, the preferred embodiments of the invention as set forth herein are intended to be illustrative, not limiting. Various changes may be made without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. A vending machine comprising:

information supplying means for supplying utilization information relating to a particular user's last use of the vending machine to the vending machine;

storing means for storing an inventory of programs and for storing supply information relating to dates when the programs were added to the vending machine;

comparing means for comparing the utilization information with the supply information stored in said storing means;

selecting means for selecting from said storing means programs which have been added to the inventory after the user last utilized the vending machine on the basis of the comparison of said comparing means; and

displaying means for displaying the programs selected by said selecting means.

2. A vending machine as defined in claim 1, wherein: said information supplying means supplies the vending machine with designated model information indicating a model of the user's computer having an ability to execute programs;

said storing means stores information regarding models of computers having an ability to execute programs stored in said storing means;

said comparing means compares said utilization information supplied from said information supplying means with the supply information stored in said storing means and compares said designated model information supplied from said information supplying means with said model information stored in said storing means; and

said selecting means selects programs which were commonly obtained in both comparisons made by said comparing means.

3. A vending machine as defined in claim 1, wherein the information supplying means comprises information storage means for storing utilization information relating to a particular user's last use of the vending machine and information reading means for reading the utilization information from the information storage means.

4. The vending machine as defined in claim 3, wherein said information storage means is a card having storage to which said utilization information is written.

5. The vending machine as defined in claim 3, wherein said information storage means is a card having storage to which said utilization information is written, said utilization information being rewritten when the user uses the machine.

6. The vending machine as defined in claim 5, further comprising:

information rewriting means for rewriting the utilization information.

7. A vending machine as defined in claim 1, wherein: said information supplying means supplies category information relating to categories of programs previously purchased by the user;

said storing means stores information regarding categories of programs stored in said storing means;

said comparing means compares said utilization information stored in said information storage means with the supply information stored in said storing means and compares said category information stored in said information storage means with the category information stored in said storing means; and

said selecting means selects programs which were commonly obtained in both comparisons made by said comparing means.

8. A vending machine comprising:

information storage means for storing category information relating to categories of programs previously purchased by a particular user with the vending machine;

means for updating said category information, said category information being updated whenever the user uses said vending machine;

information reading means for reading the information from the information storage means;

storing means for storing programs and for storing descriptive information relating to the stored programs;

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comparing means for comparing the descriptive information stored in said storing means with the updated category information stored in the information storage means;

selecting means for selecting from said storing means programs on the basis of the comparison made by said comparing means; and

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displaying means for displaying the programs selected by said selecting means.

9. The vending machine as defined in claim 8, wherein said information storage means is a card, said information storage means further storing information indicating a date the user last utilized the vending machine.

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United States Patent [19]

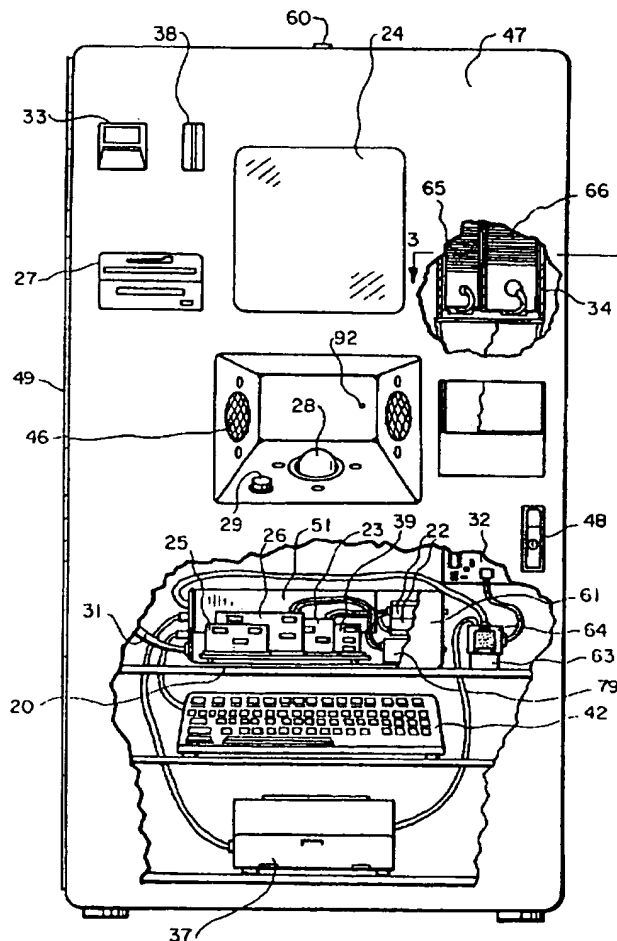
Christiansen et al.

[11] **Patent Number:** 5,748,485[45] **Date of Patent:** May 5, 1998[54] **SOFTWARE VENDING MACHINE HAVING
CD-ROM STORAGE**[75] **Inventors:** Lars K. Christiansen, Bluffdale; Mark
H. Roberts, Midvale; David J.
Griffiths, Spanish Fork; Brent R.
Adamson, Wendover, all of Utah[73] **Assignee:** LaserVend, Inc., Orem, Utah[21] **Appl. No.:** 420,122[22] **Filed:** Apr. 11, 1995[51] **Int. CL⁶** G06F 17/00[52] **U.S. Cl.** 364/479.04; 395/216; 364/479.06[58] **Field of Search** 364/401, 478,
364/479, 410, 479.01-479.08, 479.1-479.14;
235/381; 369/84; 360/15, 60; 380/4, 22;
395/221, 218[56] **References Cited****U.S. PATENT DOCUMENTS**

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5,513,116 4/1996 Buckley et al. 364/479
5,518,325 5/1996 Kahle 369/84*Primary Examiner*—Reba L. Elmore*Assistant Examiner*—Steven R. Garland*Attorney, Agent, or Firm*—Mallinckrodt & Mallinckrodt[57] **ABSTRACT**

A vending machine for vending computer software comprises, a bill acceptor for receiving money, an optical disk for storing a selection of programs to be vended, a hard disk drive for storing operating software, accounting information, and updates to the software vended, a diskette dispenser, and a disk drive all under control of a processor. The invention further comprises a device for indicating a program selection to the processor such that the processor may direct the writing of a customer-selected program to a diskette after money has been received.

23 Claims, 4 Drawing Sheets

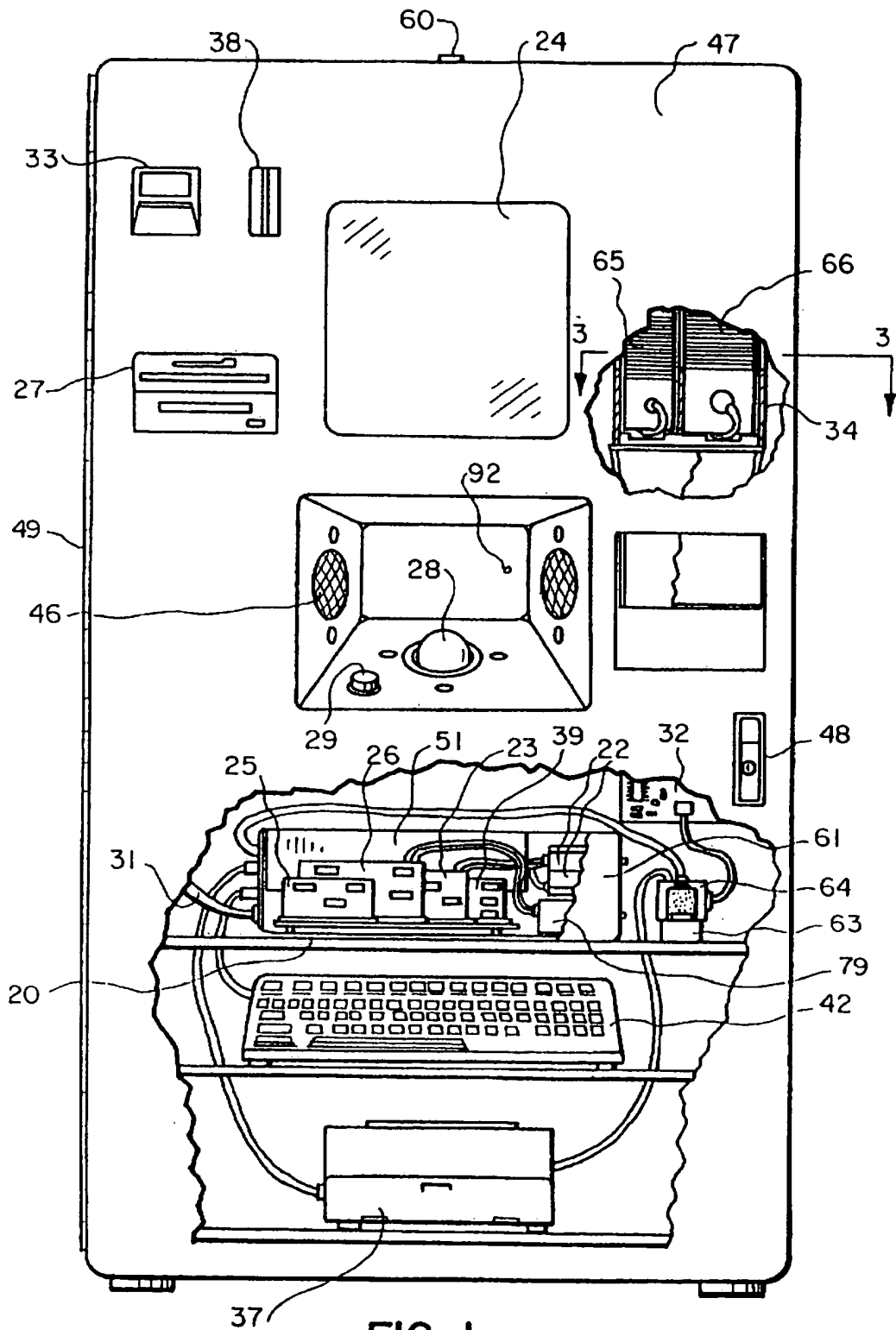


FIG. I

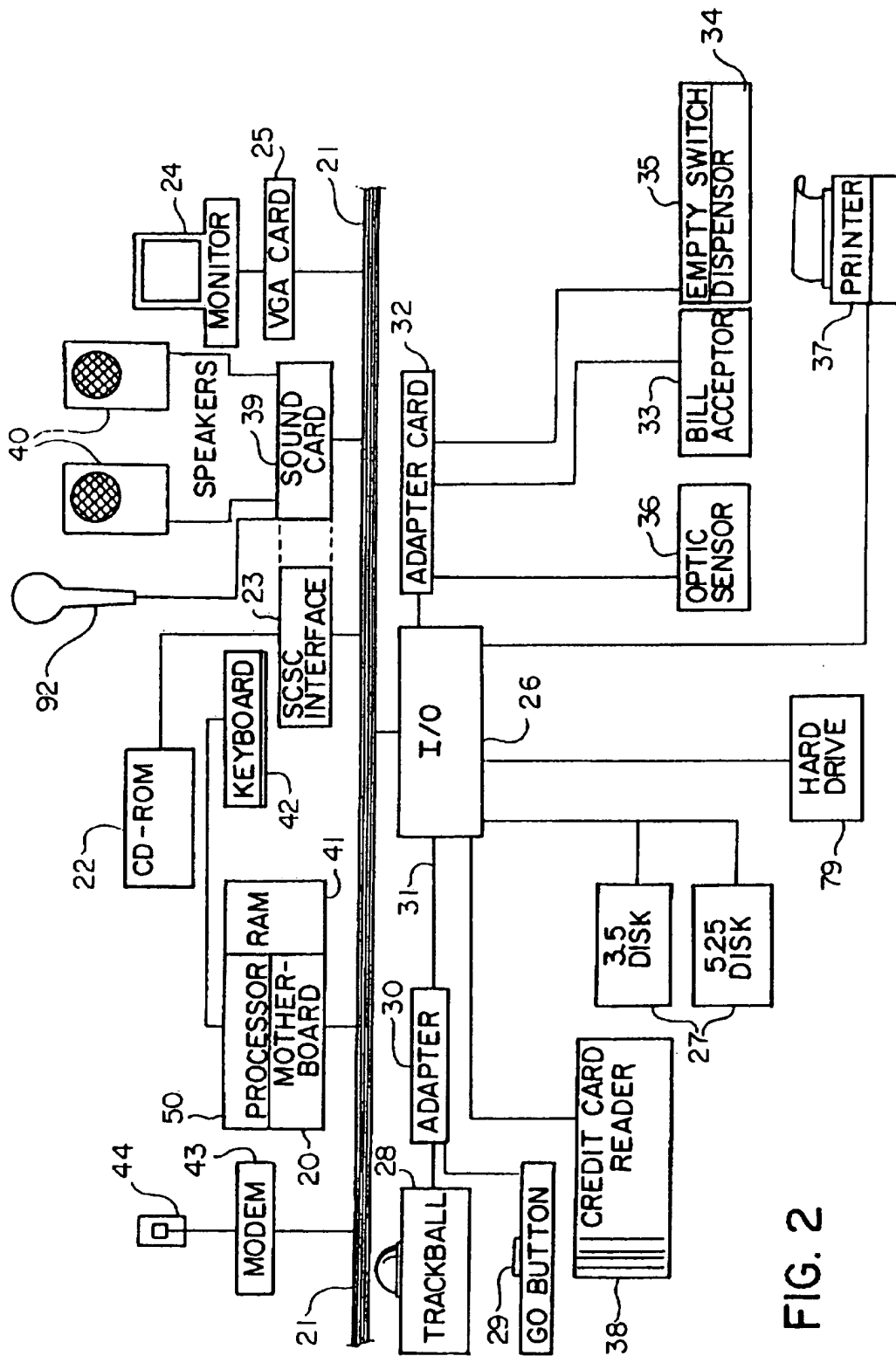


FIG. 2

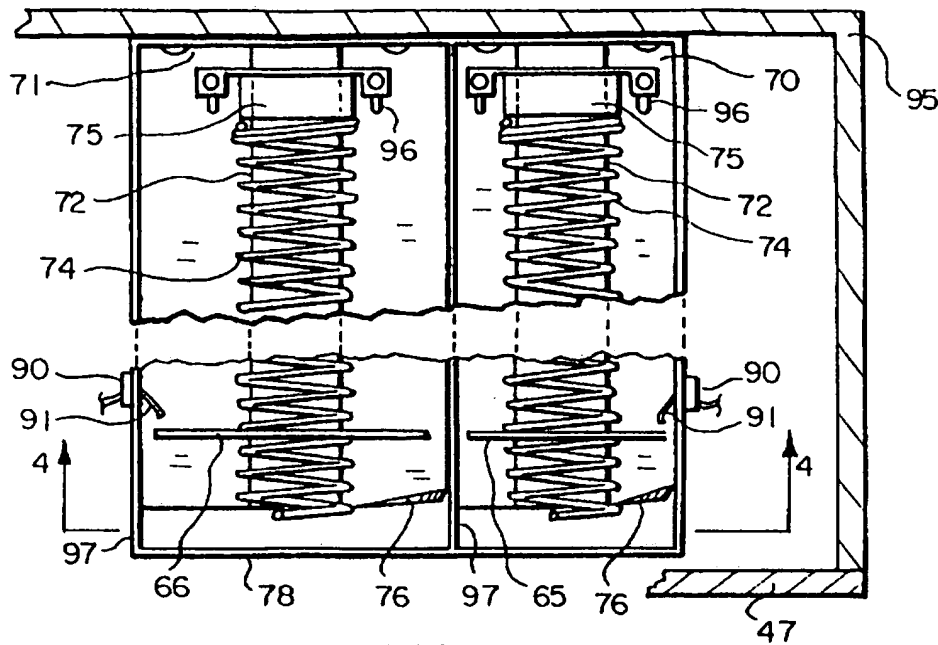


FIG. 3

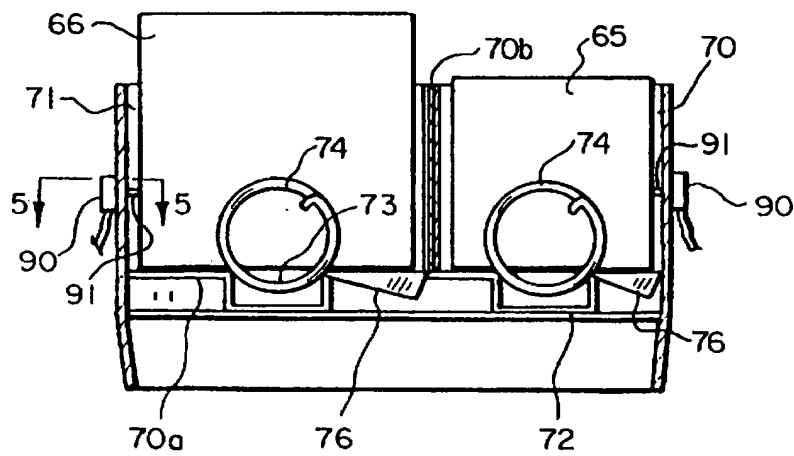
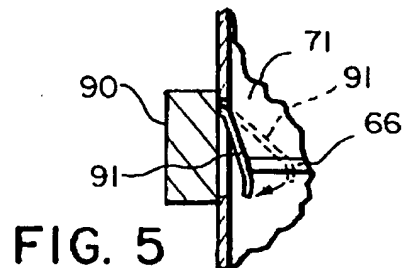


FIG. 4



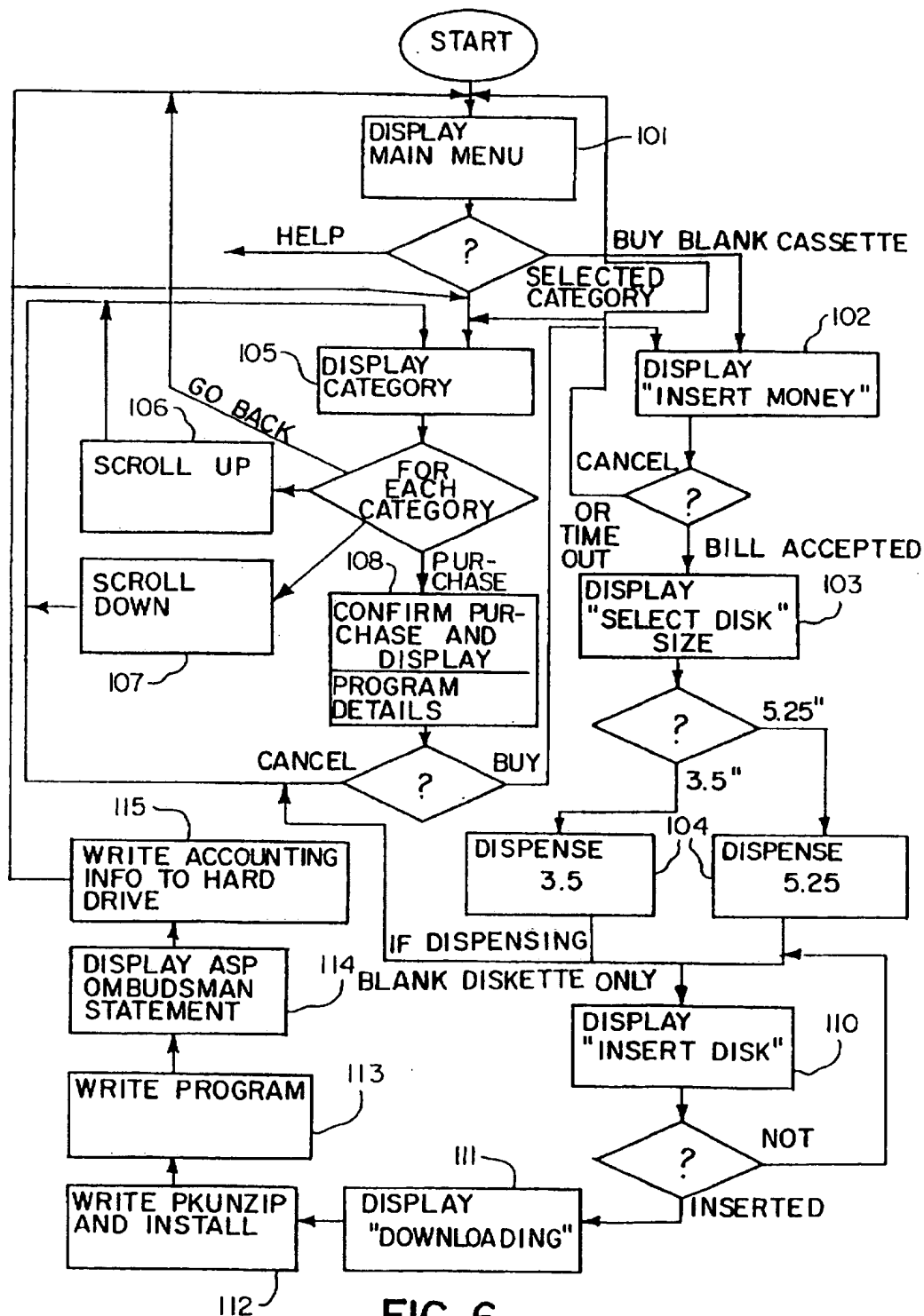


FIG. 6

SOFTWARE VENDING MACHINE HAVING CD-ROM STORAGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the field of software vending machines. More particularly, the present invention relates to software vending machines comprising a computer, a storage device for software programs, apparatus for collecting money or billing a charge account, a device for selecting which of several software programs are to be vended, and a device for duplicating programs onto a removable storage media that is compatible with a customer's computer system.

2. State of the Art

In modern times, there has been an explosion of available software, especially that subset of software known as shareware. Literally thousands of programs are available. Some of these programs sell much more frequently than do others. A conventional vending machine, such as those commonly used for candy, has a fixed capacity, and typically can hold only one or two dozen each of a fixed number of products. Conventional vending machines capable of handling more than 100 different products are bulky and rare. If used for selling software, a conventional vending machine offers a small selection of programs with a high likelihood that a particularly "hot" selling program may run out of stock.

Specialized software vending machines allow any of a large number of programs to be dispensed at a buyer's request onto blank, or preformatted, media that may be stocked in bulk within the machine. These machines eliminate the risk of "hot" product sellouts while slow selling product is still stocked in the machine because the identifying of media to the product occurs at the time of vending. These machines also can offer a much greater variety of products than possible with conventional vending machines.

U. S. Pat. No. 4,672,554, issued on Jun. 9, 1987 to Hirokazu Ogaki, describes an early software vending machine. This device used a hard disk drive for storage of software programs to be vended, and a tape cassette as the removable storage media on which programs are dispensed. A quantity of blank tape cassettes is stored within the machine. A rack holds ads for individual programs, and a numeric keypad is provided for user selection of the software to be dispensed. A floppy disk drive (column 5, lines 30-40) is provided for loading programs onto the hard disk, but is apparently not used for duplicating purchased software.

U. S. Pat. No. 4,674,055, issued on Jun. 16, 1987, also to Hirokazu Ogaki, describes a system in which a number of remote software vending machines resembling those of U.S. Pat. No. 4,672,554 are connected to a central host processor. The central host is responsible for collecting accounting information from each remote vending machine, and for updating the hard drives of the remote machines with new software to be vended. Neither Ogaki patent discloses the use of an optical read-only disk for program storage or audible instructions for machine operation, nor does either Ogaki patent disclose the automatic verification of credit cards. Further, Ogaki does not disclose the use of audible messages to instruct a customer in machine operation, or to inform customers of the characteristics of programs available for vending.

U.S. Pat. No. 5,267,171, issued to Takamitsu Suzuki on Nov. 30, 1993, describes a software vending machine which

further comprises a reader for a customer identification card. This card contains information regarding past transactions with the customer, including the type of computer owned by that customer and category of software last purchased by the customer. The software vending machine uses this record of past purchases to go directly to a menu of available software suitable for that customer's computer in the last purchased category, and to display first those programs which have been installed on the vending machine after the last purchase by that customer. This machine writes vended software onto a floppy disk instead of to the tape cassette of U.S. Pat. 4,672,554, and incorporates a printer for dispensing instructions for using the vended software.

In recent times, the CD-ROM has become a practical device for storage of large quantities of read-only information. Typical CD-ROM devices in current production store up to 650 megabytes of data as a pattern of indentations on a five inch plastic disc similar to those discs commonly sold bearing audio compositions. Data is read optically. Larger capacity optically read disks are available using technology similar to that used for laser video disks. Some vendors are moving towards a standard for an optically read disc similar in size to a CD-ROM, but having substantially greater capacity than current CD-ROMS; these devices are not yet on the market but may be expected soon.

The floppy disk has virtually entirely supplanted tape cassettes as the medium of choice for delivery of software to consumers. CD-ROM is becoming increasingly popular as a medium for distributing software that would otherwise occupy large numbers of floppy disks. Recently collections of software programs have become available on CD-ROM in encrypted form, where an owner of the CD-ROM may obtain a decryption key for a specific program upon payment of a program-specific fee. Fee payment and distribution of the decryption key is typically done by way of telephone, a credit card number is given to an operator in exchange for the decryption key. Because typographical errors in entering the key may result in failure of the decryption, sellers of software may use keys that are shorter and simpler to enter than required for adequate security.

In recent times, much software has been distributed as shareware. Shareware consists of software which is distributed freely to users by permission of the author. Shareware is distinguished from freeware in that shareware is distributed under the understanding that use of the software beyond an initial trial period requires payment of a licensing fee to the authors of the software.

Many conventional vending machines now use an electrically rotated helix in a tray as a dispensing device. The item to be dispensed is placed between turns of the helix, the first item to be dispensed located approximately one turn of the helix from the end of the helix. The helix is positioned in the tray such that the bottom of the tray is present under the items in the helix to be dispensed, and not present under the end of the helix. When an item is dispensed, the helix is rotated one revolution, during which the item being dispensed is pushed to the end of the helix. As there is no tray under the end of the helix, gravity then causes the item to fall into a receiving bin.

SUMMARY OF THE INVENTION

The present invention comprises a software vending machine that incorporates a processor, a CD-ROM or other high capacity optically read disk and drive for storage of the software to be vended, a dispensing device for floppy disks, a bill acceptor for receiving money, a CRT monitor for

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displaying a menu of software programs available to be vended, a device for selecting the software program to be vended, and a floppy disk drive for writing the software program onto the floppy disk. Typical embodiments of the present invention further comprise a magnetic hard disk drive for storing system software and interim updates to the software to be vended. Alternative embodiments of the present invention also include a reader for the magnetic stripes encoded on credit cards, and may further include a modem.

The bill acceptor, credit card reader, CD-ROM, hard disk, dispensing device for floppy disks, the device for writing, the device for selecting software to be vended, and the modem are all interfaced to and controlled by the processor.

In operation of the present invention, a customer selects from a menu of menus. The selected menu is a menu of software titles available in some category of interest to the customer. The customer then selects the desired software from this menu. Selection is by means of a trackball, which is used to position a cursor on the monitor screen, and a "click" button. A short paragraph of information may be displayed about each program to assist the customer's decision, as well as the number of floppy disks required for the program and the fee that the machine will collect from the customer before vending the program.

Should the user decide to go ahead with the transaction, that user is prompted to place money sufficient to cover the price of the selected software in the bill acceptor. A floppy disk will then be ejected by the diskette dispenser, and the customer will be prompted to place the dispensed disk in the suitable floppy disk drive. The software purchased will then be copied onto the disk. Software is typically placed on the diskettes in compressed form, together with a decompression utility that will decompress the software into usable form on the customer's hard disk.

In an alternate mode of operation, when the user is prompted to insert money, the user may instead swipe a credit card through the credit card reading device. The software vending machine will, through the modem, automatically dial a credit verification service. When an approval code is received from the credit verification service, the machine will dispense diskettes and write the selected software on the dispensed diskettes.

In an alternate mode of operation, the software vending machine of the present invention may dispense a CD-ROM containing a number of software packages sold as a set.

In yet another mode of operation, the software vending machine of the present invention may dispense a CD-ROM containing a number of software packages in encrypted format. The CD-ROM may or may not also include unencrypted "free" programs. A floppy disk will also be dispensed, and the customer will be prompted to insert the floppy disk in the appropriate size floppy disk drive. One or more decryption keys, or a combination of a decrypting install program and decryption key, will then be copied onto the floppy disk. The customer may then take the diskette and CD-ROM to his own computer, whereupon the decryption key on the floppy disk can be used by a decrypting install program to decrypt only those programs on the CD-ROM for which the customer has paid a required licensing fee.

It was found that a typical rotating helix dispenser would jam and otherwise fail to dispense floppy disks. A rotating helix dispenser having the dimensions, slope, helix construction, and channel hereafter disclosed was able to properly dispense floppy disks.

THE DRAWINGS

The best mode presently contemplated for carrying out the invention is illustrated in the accompanying drawings, in which:

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FIG. 1, is a front elevation of the software vending machine of the present invention cut away to show the helical diskette dispenser, the computer case, and the CD-ROM drive, with the computer case further cut away to show some of the boards in the case, and the front plate of the diskette dispenser removed;

FIG. 2, a block diagram of a software vending machine of the present invention;

FIG. 3, a fragmentary horizontal section taken on the line 3—3 of FIG. 1, showing in top plan view the helical coil and tray used for dispensing diskettes in the present invention;

FIG. 4, a vertical sectional view of the helical coil and tray used for dispensing diskettes in the present invention taken at the line 4—4 of FIG. 3;

FIG. 5, a fragmentary horizontal section taken on the line 5—5 of FIG. 4 showing in top plan view the microswitch used to detect diskette empty in the diskette dispenser of the present invention; and

FIG. 6, a simplified flow chart of the software vending applications program utilized by the machine.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

The present invention comprises a software vending machine built around a standard motherboard 20 containing a processor 50 and power supply 51 for an IBM-compatible computer of the 80386 class or higher. This motherboard is equipped with several 16-bit standard ISA bus slots 21. One or more, in the present preferred embodiment two, CD-ROM drives 22 are interfaced to an ISA bus slot of this motherboard through a SCSI interface 23, and a standard color SVGA monitor 24 is interfaced to the ISA bus through a standard SVGA interface card 25.

A standard multi-I/O card 26 is also provided to interface the ISA bus 21 to a 420 megabyte Conner Peripherals IDE interface hard disk drive 79, and to a pair of floppy disk drives 27, one of which is in the presently preferred embodiment a 3½ inch Teac FD235HF 1.44 megabyte (formatted) drive and the other a 5¼ inch Teac FD55GFR 1.2 megabyte (formatted) drive.

Also interfaced to the ISA bus 21 through the multi-I/O card 26 is an optical trackball 28 and selection button 29, which are interfaced to a serial port by means of an adapter card 30 and serial interface cable 31. The trackball and selection button together appear to the system software as if they were a mouse.

A parallel printer port on the multi I/O card 26 is connected to a custom built adapter card 32, that is further interfaced to a JCM 45DV high security bill acceptor 33, made by JCM of Las Vegas, Nev., an electromechanical diskette dispenser 34 having a tray-empty detection switch 35, and an optical sensor 36. The adapter card 32 contains a serial to parallel converter that translates the serial output of the bill acceptor 33 into a parallel form that may be read by the parallel printer port on the multi I/O card 26. The adapter card 32 also contains power drivers for the diskette dispenser motors 75 and the amplifiers and filters for the photosensor 36.

Also connected to a second parallel printer port of the multi I/O card is a printer 37. This printer is provided for producing a hard copy of accounting information. A reader 38 for the magnetically encoded stripe present on the back of most credit cards is also provided in an alternate preferred embodiment of the present invention, and is connected to a serial port on the multi I/O card 26.

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Also connected to the ISA bus 21 is a "soundblaster 16" compatible sound card 39, which may or may not be collocated with the SCSI interface 23, and which drives a pair of speakers 40. The motherboard 20 is equipped with eight megabytes of Random Access Memory (RAM) 41 and is attached to a standard keyboard 42.

The present invention further comprises a modem card 43 connected to the ISA bus. This modem may be further connected to a telephone line 44 for use in remote access to accounting information and for use in validating credit card information.

The trackball 28, selection button 29, diskette drives 27, an in take slot of the bill acceptor 33, a faceplate of the monitor 24, and a receiving bin for the diskette dispenser 34 are mounted such that they are accessible to the customer of the machine. Some of these components, including the bill acceptor 33, are mounted on and are accessible through a door 47, other components, such as the monitor 24, are mounted within a cabinet 95 such that they line up with a hole in the door when the door 47 is closed. The speakers 40 are mounted behind grilles 46 in such a manner that the customer can hear sound generated by the speakers 40. The door 47 has a lock 48 and is mounted on hinges 49 to the cabinet to form a lockable compartment containing the remaining components of the machine, including the keyboard 42. A system reset switch 60 is mounted at the rear of the top of the cabinet. Within this lockable compartment is a standard computer case 61 wherein the motherboard 20, power supply 51, Multi I/O card 26, CD-ROM drive 22, SCSI interface 23, sound card 39, and VGA card 25 are mounted. Also mounted within the cabinet is a 24-volt D. C. power supply 64 for the diskette dispenser and a surge suppressor 63 for protection of the software vending machine from power line or phone line transients.

An alternate preferred embodiment of the present invention uses a touch screen (not shown) instead of the trackball 28 and the selection button 29 of the first commercial embodiment of the present invention for selecting the software to be vended.

In yet another embodiment of the present invention, a CD-ROM device having an IDE interface is used. This device may attach to the IDE interface on the Multi I/O card 26, and the SCSI interface 23 may be eliminated from the system. This technique, however, permits a smaller total number of CD-ROM drives than possible with a SCSI interface and is therefore not preferred at the present time.

In yet another embodiment of the present invention, the IDE interface hard disk 79 may be replaced by a SCSI interface hard disk, which may be connected to the SCSI interface 23 instead of to the Multi I/O card 26. In this embodiment, no IDE interface is required on the Multi I/O card, although the floppy drive interface, serial port, and parallel port are still required.

The motherboard and 20 and processor 50, power supply 51, CD-ROM drive 22, SCSI adapter 23, monitor 24, SVGA card 25, multi I/O card 26, hard disk 79, floppy drives 27, sound card 39, speakers 40, RAM 41, printer 37 and keyboard 41 are all standard parts readily available in computer stores.

The motherboard 20 contains a copy of a BIOS system that has been configured such that the processor 50 may only boot from the hard disk drive 79. The hard disk drive 79 contains a copy of the Microsoft MS-DOS operating system, version 6.0 or higher, with multimedia extensions MSCDEX version 2.22 or higher, and a copy of Microsoft Windows 3.1 or better. The system is configured by means of an "autoex-

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ec.bat" and a "config.sys" file to automatically load the MS-DOS system, the MSCDEX extensions, and Microsoft Windows. Microsoft Windows is further configured to automatically load a software vending applications program and a screensaver program whenever power is applied to the system or the reset button 60 is hit.

The screensaver program running on the processor 50 causes the SVGA card 25 to display an enticement sequence on the monitor 24 that is intended to draw attention of passers by. This enticement sequence may include an audio component should the owner of the machine enable this feature. Should a nearby passer by be enticed close enough to the machine to cause a decrease in the light level at the machine, as measured by the photosensor 36, an additional audio enticement sequence may be generated, and, with luck, the passer by may become a customer.

When a customer turns the trackball, the trackball 28 will send a series of signals to the Multi I/O card 26. These signals will be received through the Multi I/O card 26 and the ISA Bus 21 to the processor 50 on the motherboard 20. The software vending program running on the processor 50 will then preempt the screensaver enticement sequence and take over control of the monitor. The processor 50 will track these trackball signals, displaying by means of the SVGA card 25 a top-level menu and a cursor corresponding to trackball signals on the monitor 24. When the cursor is positioned over a "button" region on the monitor 24, the customer may press, or "click" the selection button 29. The processor 50 may then display a sub-menu of available software categories. When the cursor is positioned over a category on this sub-menu, the customer may press the selection button 29 again, whereupon the processor 50 may cause a list of available software selections to be displayed on the monitor 24.

Since the list of available software selections in a given category is often too long to be displayed on one screen of the monitor 24, up and a down "button" areas on the screen are displayed along with a subset of the available selections. The customer may position the cursor over these up and down buttons and press the button 29, whereupon the processor 50 may scroll the list of software titles to display additional titles to the customer. When the customer selects a title by pressing the selection button with the cursor positioned over the desired software entry in the sub-menu, the processor 50 may cause the SVGA card to display a paragraph of text on the monitor 24 describing the indicated software, including the price of the indicated software, and the processor 50 may cause the sound card 39 and speakers 40 to generate an audible message describing the software and the actions the customer may take.

The customer may then choose to select a different program, whereupon the description of that program will be displayed. The customer may also choose to continue with a purchase of the indicated software. Should the customer decide to continue with a purchase of the software, the customer will use the trackball 28 to position the cursor over a "buy" button on the monitor 24, and press the button 29. At this point, the customer will be advised audibly by means of the sound card 39 and speakers 40, and visually by means of text displayed on the monitor 24, to insert currency in the bill validator 33. When sufficient cash has been received by the machine, the processor 50 will cause the diskette dispenser 34 to eject the appropriate number of preformatted diskettes, and the sound card 39 and monitor 24 to advise the customer to place one of these diskettes in the appropriate floppy disk drive 27. Once the floppy disk is in the drive, the processor 50 will copy the selected program from the

CD-ROM 22 into the RAM 41, and from the RAM 41 onto the floppy disk.

In the preferred embodiment of the present invention, there is more than one CD-ROM drive 22 attached to the SCSI interface 23. The presently preferred embodiment of the invention incorporates two CD-ROM drives 22. This permits storage of a greater number of, or the same number of larger, software programs to be vended. The SCSI interface 23 can support up to seven such CD-ROM drives 22.

In an alternate embodiment of the present invention, the machine is equipped with a device 38 for reading the magnetic stripe of credit cards in addition to the bill validator 33. When a customer has selected a program, that customer may position the cursor over either a "buy cash" or a "buy credit" button region on the monitor and pressing the button. If the customer presses the button while the cursor is positioned on the "buy credit" button region on the monitor, the processor 50 advise the customer audibly by means of the sound card 39 and speakers 40, and visually by means of text displayed on the monitor 24, to swipe his credit card through the device 38 for reading magnetic stripes. The magnetic stripe reader 38 will read the customer's credit account information from the card, which will be communicated to the processor 50.

The processor 50 will then, my means of modem 43, telephone a credit verification service (not shown) and request validation of the credit account information and credit approval for the selling price of the selected software. If the credit account information is validated successfully and the credit transaction approved for the price of the selected software, the processor 50 will cause the diskette dispenser 34 to eject the appropriate number of diskettes 65, and the sound card 39 and the monitor 24 to advise the customer to place one of these diskettes in the appropriate floppy disk drive 27. Once the floppy disk is in the drive, the processor 50 will copy the selected program from the CD-ROM 22 into the RAM 41, and from the RAM 41 onto the floppy disk. The program being vended is copied to the diskette in compressed form, together with a decompression utility and an installation program. While copying the program from the CD-ROM 22 to the floppy disk 27, the processor 50 will check a table of updates on the hard disk 79. Should one or more of the program files on the CD-ROM 22 have a corresponding updated file on the hard disk 79, the updated file will be written to the floppy disk 27 instead of the obsolete version located on the CD-ROM 22.

Upon completion of writing the floppy disk, or a series of disks for programs that are too large to fit on one floppy disk, the processor 50 will write accounting information relevant to the completed transaction on the hard disk drive 79. This information may also be printed by printer 37 to provide a hard copy of the record. This accounting information may be used to determine what, if any, royalties are due to the owners of the copyrights in the dispensed software.

In an alternate preferred embodiment of the present invention, two floppy disk drives 27 are provided in the same diskette size. Such a machine may provide two 3½ inch diskette drives for transferring vended programs to the popular 3½ inch format diskettes. When a program requiring two or more diskettes is purchased, the customer may be requested by the machine to place one diskette in each drive. The machine may then copy the vended software to multiple diskettes by alternating between copying to the first drive, and copying to the second drive of the drive pair. In this manner, the machine may copy the purchased software onto diskettes in less total time than would be the case if only a

single drive were provided because the customer can change the floppy disk in one drive while the other drive is copying part of the program.

Many software programs available today require a large quantity of diskettes, programs requiring several tens of megabytes are no longer uncommon. Several of these programs may, however, still fit on one CD-ROM. Yet another embodiment of the present invention may vend such large software programs by dispensing both a CD-ROM 66 and a floppy disk 65. The dispensed CD-ROM 66 contains a number of large programs in encrypted form, and may also contain a number of additional shareware programs in unencrypted form. Programs may be compressed prior to being encrypted. Encryption may utilize the NES encryption standard or any other encryption technology. After dispensing the floppy disk 65 and the CD-ROM 66, the machine will prompt the customer to place the floppy disk 65 in the appropriate diskette drive 27, and the decryption key required for proper decryption of the vended software will then be written to the floppy disk.

The machine may be accessed from a central location to allow the accounting information to be read, to enter minor software updates onto the hard disk, and for diagnostic purposes. This may be done by setting the modem 43 to automatically answer a telephone line 44. A centrally located host machine may dial the number to which the software vending machine is connected. When the modem 43 answers, the software vending machine may request a password. Two passwords are provided, one for factory use, and one for use by the owner of the machine. Once the password is entered, the owner or factory may conduct diagnostics, software updates, or access accounting information via the phone line without being physically present at the machine location.

For proper dispensing of 3.5 inch diskettes, it was found necessary to use a steel dispensing tray 70 four inches wide, and for dispensing 5.25 inch diskettes or CD-ROMS a tray 71 six inches wide. The bottom of each tray is formed with a recessed channel 72 that is 1.75 inches wide and ¼ inch deep running the entire 23 inch length of the tray. The channel allows the top of the bottom portion 73 of each turn of the helix 74 to sit below the bottom of the diskettes 65. The diskettes rest on the tray over the channel and between tray sides 70b which keep the diskettes positioned in the tray. The channel 72 also helps to keep the helix centered in the tray. It is preferred that the rear of each tray be elevated 4 inches above the elevation of the front of each tray, this sloping of the tray has been found helpful in keeping the helix stretched to its normal working length, and avoiding compression of the helix due to friction of the diskettes as they slide along the tray bottom during operation of the helix. This slope helps avoid jamming of diskettes in the dispenser.

The helix 74 is generally formed of 0.048 inch diameter spring steel with a turn pitch of ⅜ inch. The helix is 2.5 inches in diameter. The length of the helix can vary depending on the desired number of diskettes to be stored in the dispenser, but for the described diameter of spring steel, the maximum length of the helix for reliable operation is about 23 inches. A 23 inch helix can hold about 33 diskettes.

The dispensing motors 75 for each helix, which are standard motors common in the rotating helix vending machine industry, for each helix are mounted by bolting them to slots 96 formed in the rear portion of each tray. These slots 96 allow the motor positions to be adjusted such that the front end of the helix extends past the front end of

the tray far enough that diskettes will drop freely when dispensed, but that the next diskette in line will remain supported by the tray.

A triangular portion 76 of the right side of each tray, extending from the right side of the channel to the right side of the tray, and to a point $\frac{3}{4}$ of an inch back from the front of the tray at the right side of the tray, of the bottom of each tray, is bent downwards at 45 degrees. This bend in the bottom of each tray forms a ramp that has been found to help prevent diskettes from hanging up on the end of the tray as they are dispensed. Each side wall of the tray is formed with a tab extending forwards past the end of the tray bottom by one inch. Side walls of the trays are approximately one and three fourths inch high. This tab helps keep the dispensed diskette aligned in the tray until the diskette falls past the end of the tray bottom, thereby preventing the diskettes from hanging up and jamming. A front end plate 78 of the dispenser is supported by these tabs.

The diskette dispenser is further equipped with a sensing microswitch 90, which has a feeler 91 extending into the space within the dispenser tray 70 that is normally occupied by diskettes 65. This switch is set to determine when there are less than four remaining diskettes in the tray. This switch is interfaced to the ISA bus 21, so that an "out of diskettes" message may be displayed to potential customers. The processor may also be configured to send a message to a central location by means of the modem 43 and the telephone line 44 to notify the owner when the machine has run out of diskettes. When the machine is out of diskettes, an alternate embodiment of the present invention may vend software onto customer supplied diskettes.

Another alternate embodiment of the present invention incorporates a microphone 92 connected to the sound card 39. Should a customer desire to leave a comment about the machine, or the selection of software vended by the machine, the customer may click on a "leave message" button area of the screen 24 and speak into the microphone 92. The sound card 39 will then digitize the customer's voice and write the digitized sound to the hard disk 79. Another alternate embodiment of the present invention utilizes a CD-ROM changer instead of a plurality of CD-ROM drives 22. A CD-ROM changer allows a single CD-ROM drive 22 to be used to automatically play one of a number of CD-ROMS. This alternate embodiment will allow a greater variety of software to be stored in the machine than possible with a single CD-ROM drive.

The software vending machine of the present invention may also operate as a vending machine for sales of individual diskettes without recording software on the diskettes. The price of such blank, formatted, diskettes may be set lower than the price for diskettes containing programs.

Typical operation of the machine may be understood through the simplified flowchart of FIG. 6. At initialization, the machine displays 101 a main menu that lists a number of software categories, together with an option to buy only a blank diskette and an option to provide user help. If the trackball is not moved within a time limit, the screensaver begins the enticement sequence. When the trackball is moved, the enticement sequence is stopped and the main menu 101 is displayed again.

If the customer clicks the buy blank diskette option, the program displays an insert money screen 102 requesting the price of the diskette. If no cash is received before a timer expires, the machine reverts to the main menu 101, if cash is received the program displays a select disk size screen 103. The user may then select a diskette size, and the

appropriate diskette will be dispensed 104. If the machine was dispensing a blank diskette, the machine will then revert to displaying the main menu.

If the customer clicks on a category of programs, a list of programs within that category will be displayed 105. The customer may choose to return to the main menu 101, may scroll the category menu up 106 or down 107, or may click on a program 108. If the user clicks on a program, a description of that program will be displayed, which may or may not include audio and video sequences. The customer may choose to return to the category menu, to cancel the transaction returning to the main menu, or may click on a "buy program" option. If the customer clicks on the buy program option, the program will cause the insert money screen 102 to be displayed with the price of the program to be vended.

If the customer opted to purchase a program, after the diskettes are dispensed 104 the customer will be advised to insert a diskette in the appropriate drive 111. When the diskette is inserted, the machine will display a "downloading" message, and copy a decompression utility (PKUNZIP) and an installation utility to the diskette 112. The compressed program to be vended is then copied to the diskette 113, a message thanking the customer and advising the customer of available grievance procedures is displayed 114, and the accounting information is updated on the hard drive 115.

Nothing in this application is intended to limit the scope of the present invention to the specific embodiment of the present invention that is disclosed. In particular, it may be expected that the functions of the various cards in the system may be partitioned differently; for example the SCSI interface 23 function may be combined with the sound card 39 function on one card, and the Multi I/O card 26 may be replaced by separate floppy disk interface, serial, and parallel port cards if sufficient IDE slots are provided on the motherboard 20. Also, some motherboards 20 are manufactured with serial, parallel, IDE and floppy interfaces on the motherboard, if these motherboards are used some of those functions need not be provided on the Multi I/O card. Further, the adapter card 32 may be directly interfaced to the ISA bus 21 instead of by means of the parallel port on the Multi I/O card.

It is understood that existing CD-ROM technology will be superseded in time with further generations of optically read disks, and the term CD-ROM as used herein is intended to refer to these future optically read disks. It is also possible to implement the invention using a processor of a different family, such as an Apple macintosh computer based on the Motorola 680X0 series of processors, or one based upon the IBM power-PC processors.

While the software that is dispensed is presently compressed using PKZIP 2.04G, a shareware software data compression and decompression package available from PKWARE, nothing in this application is intended to exclude alternative compression technologies. Further, nothing in this application is intended to limit the scope of the present invention to embodiments incorporating Microsoft MS-DOS version 6.0 combined with Microsoft Windows 3.1. In particular, the current version of the software dispensing application program has run successfully on Windows for Workgroups, and can be expected to run with little if any modification under the OS-2 operating system from IBM. The forthcoming Windows 95, and the existing Windows NT, systems may also be well suited to implementing the present invention. Similarly, the EISA, IBM

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Microchannel, PCI, and VL-Bus systems may replace the ISA bus for communications among some of the components of the machine.

Whereas this invention is here illustrated and described with reference to embodiments thereof presently contemplated as the best mode of carrying out such invention in actual practice, it is to be understood that various changes may be made in adapting the invention to different embodiments without departing from the broader inventive concepts disclosed herein and comprehended by the claims that follow.

We claim:

1. A self-contained software program vending machine comprising:

a cabinet;

a processor within the cabinet;

a bill acceptor in the cabinet and accessible to a user for receiving paper money and for notifying said processor when paper money has been received;

an optically read disk within the cabinet for storing a plurality of programs;

means in the cabinet under control of said processor for dispensing a blank diskette to the user after said processor has received notification of receipt of paper money;

means for writing comprising a diskette drive in the cabinet and accessible to a user under control of said processor for writing said blank diskette with a program;

a monitor in the cabinet for displaying a menu of program choices corresponding to programs stored on the optically read disk, said monitor equipped with a touch screen accessible to a user to identify to said processor a specific program to be written to said blank diskette from said optically read disk after said processor has received notification that paper money has been received.

2. The software vending machine of claim 1 wherein said means for dispensing a blank diskette further comprises means for dispensing a three and one half inch diskette and for dispensing a five and one fourth inch diskette; and wherein said means for writing said blank diskette further comprises a three and one half inch diskette drive and a five and one quarter inch diskette drive.

3. The software vending machine of claim 1 wherein said means for dispensing a blank diskette further comprises a helix that may be rotated to expel a diskette.

4. The software vending machine of claim 3 further comprising means for dispensing a CD-ROM under control of said processor.

5. A software program vending machine comprising:

a processor;

a bill acceptor for receiving paper money and for notifying said processor when paper money has been received;

an optically readable disk for storing a plurality of programs;

means under control of said processor for dispensing a blank diskette after said processor has received notification that money has been received;

a diskette drive under control of said processor for writing said blank diskette with a program;

a monitor under control of said processor for displaying a menu of program choices;

a trackball for manipulating a cursor displayed on said monitor such that said cursor indicates a particular program choice;

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a button for identifying a specific program to be vended to said processor;

a sound card and loudspeaker device for instructing users in machine operation;

a sensor to sense the presence of a potential user near the machine; and

means operable by said sensor to begin an audio enticement sequence when a potential user is sensed near the machine.

6. The software vending machine of claim 5 wherein said means for dispensing a blank further comprises a helix that may be rotated to expel a diskette.

7. The software vending machine of claim 6 further comprising means for dispensing a CD-ROM under control of said processor.

8. The software vending machine of claim 7 wherein dispensing of a CD-ROM is accompanied by dispensing of a decryption key for a specific program on floppy disk.

9. The software vending machine of claim 5 wherein said monitor may also display a video demonstration of a selected program under control of said processor.

10. The software vending machine of claim 5, wherein the sensor is a photosensor.

11. The software vending machine of claim 5 further comprising a fixed disk drive for storing software for operating said software vending machine, for storing sales statistics, and for storing updated programs to be vended.

12. The software vending machine of claim 11 wherein the vended software may be vended upon a plurality of floppy disks.

13. The software vending machine of claim 5 further comprising:

a reader for magnetically encoded credit cards; and

a modem under control of said processor for validating credit cards and obtaining credit authorizations, whereupon the processor may act as if money has been received.

14. The software vending machine of claim 13 further comprising means for dispensing a CD-ROM under control of said processor.

15. The software vending machine of claim 14 wherein said CD-ROM contains software in encrypted form, and wherein dispensing of a CD-ROM is accompanied by dispensing of a decryption key on a diskette for use in decrypting a specific program on the CD-ROM.

16. A self-contained software program vending machine comprising:

a cabinet;

a processor within the cabinet;

an optically read disk within the cabinet for storing a plurality of software programs;

means in the cabinet under control of the processor and visible to a user for indicating software programs available for vending;

means in the cabinet and accessible and operable by a user through which a user identifies a desired software program to be vended;

means in the cabinet and accessible to a user for receiving money from a user and for notifying said processor when money has been received;

a hard disk drive in the cabinet for storing operating software, accounting information, and updates to the software programs to be vended;

means in the cabinet under control of said processor for dispensing a blank diskette to the user after said processor has received notification of the receipt of money; and

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means under control of said processor and accessible to the user for writing the identified software program including any updates thereto, on said blank diskette.

17. The software vending machine of claim 16 wherein said means for dispensing a blank diskette further comprises means for dispensing a three and one half inch diskette and for dispensing a five and one fourth inch diskette; and wherein said means for writing said blank diskette further comprises a three and one half inch diskette drive and a five and one quarter inch diskette drive.

18. The software vending machine of claim 16 further comprising means under control of said processor for dispensing a CD-ROM.

19. The software vending machine of claim 18 further comprising a monitor for indicating a menu of program selections available for vending, and wherein said menu further comprises a top level menu of categories and a plurality of sub menus of programs in a given category.

20. The software vending machine of claim 19 further comprising a sound card and loudspeaker device for instructing users in machine operation and for giving information about the software.

21. The software vending machine of claim 19 wherein said monitor may also display a demonstration of a selected program under control of said processor.

22. The software vending machine of claim 18 wherein the CD-ROM dispensed contains a plurality of software in encrypted form, and wherein the means under control of said processor for writing said blank diskette writes onto said

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blank diskette a decryption key for those encrypted programs on the dispensed CD-ROM for which money has been received such that a customer may use said decryption key to decrypt the programs for which money has been received.

23. A software program vending machine comprising:

a processor;

means for receiving money and for notifying said processor when money has been received;

an optically read disk for storing a plurality of programs;

a hard disk drive for storing operating software, accounting information, and decryption keys to the software to be vended;

means under control of said processor for dispensing a blank diskette;

means under control of said processor for dispensing a CD-ROM containing thereon a plurality of software in encrypted form, different software having different encryption keys;

means for identifying to said processor a specific program to be vended; and

means under control of said processor for writing to said blank diskette a decryption key to the identified program after said processor has received notification of the receipt of money.

* * * * *

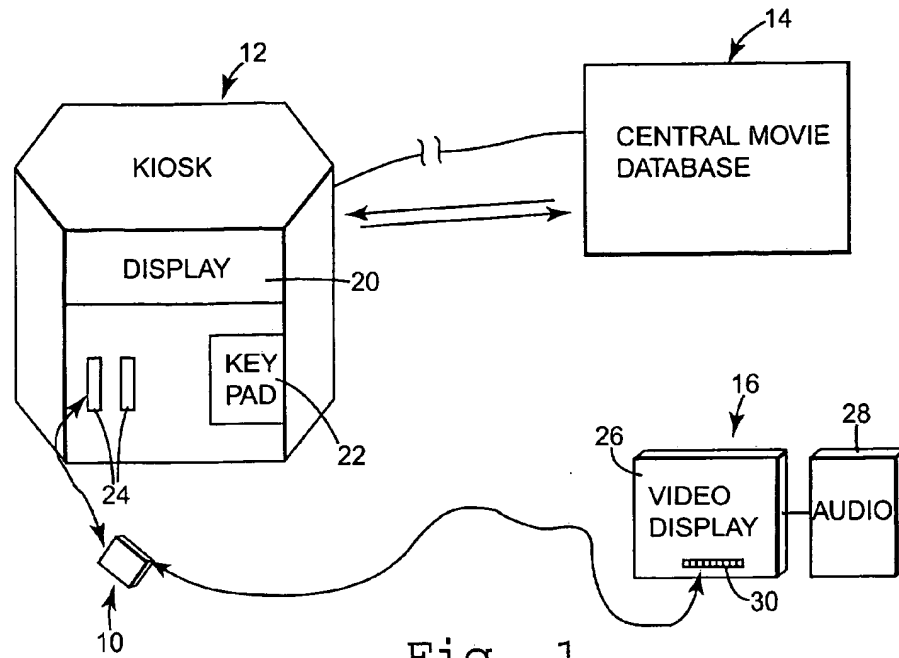


Fig. 1

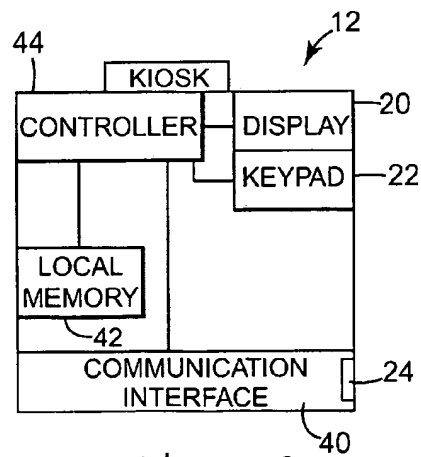


Fig. 2

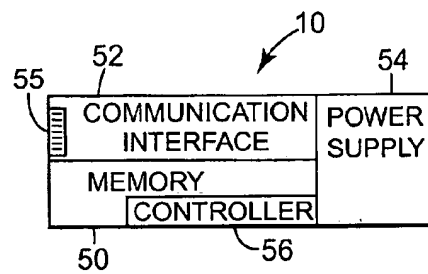


Fig. 3

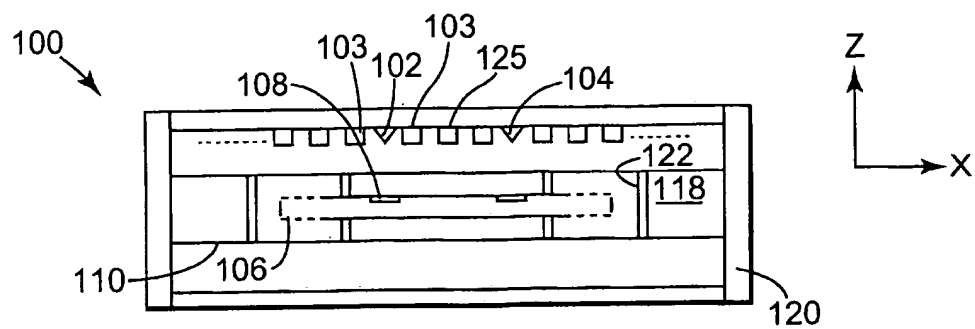


Fig. 4

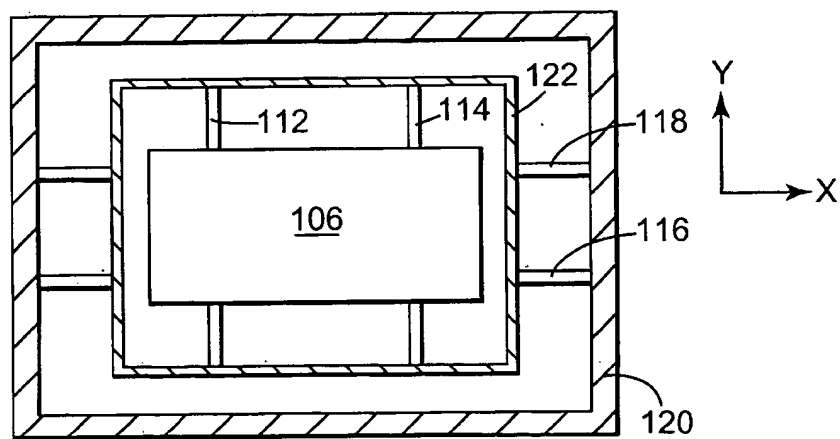


Fig. 6

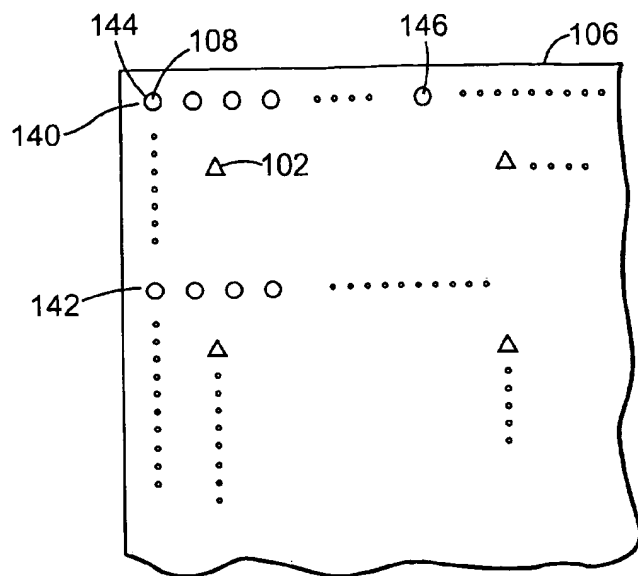


Fig. 5

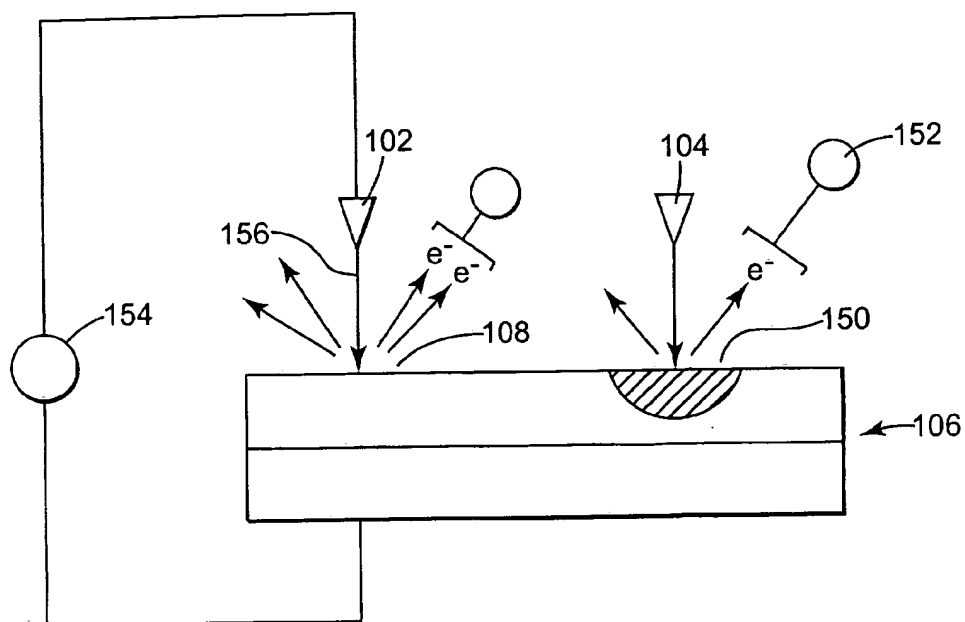


Fig. 7

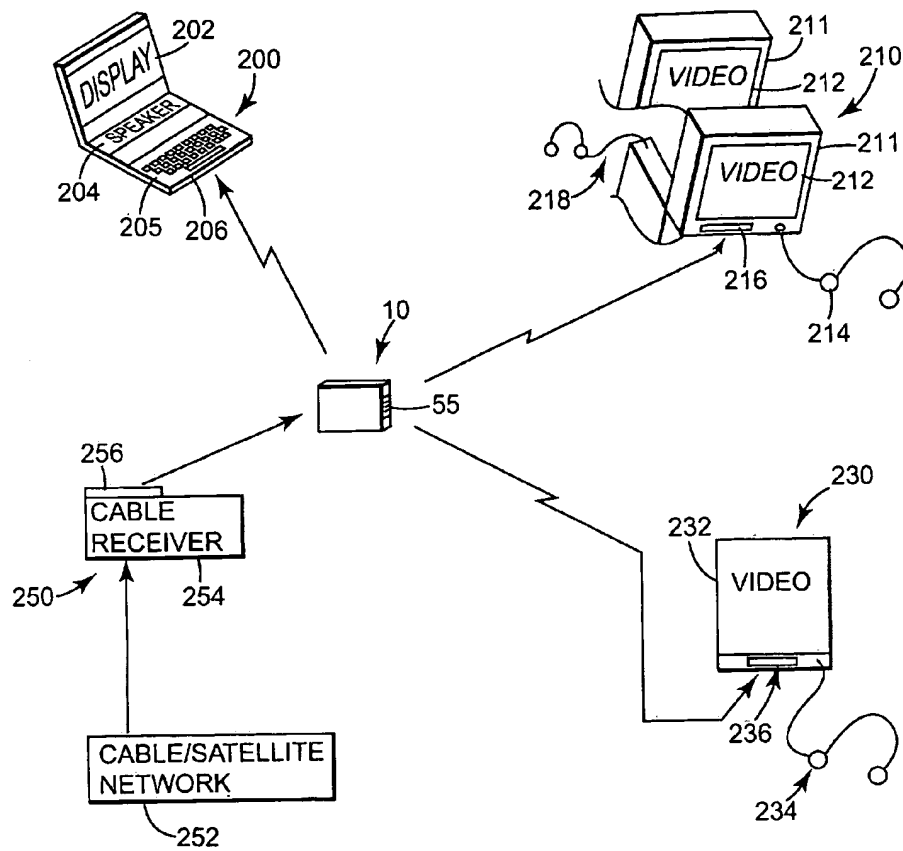


Fig. 8

PERSONAL MOVIE STORAGE MODULE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This Utility Patent Application is related to U.S. patent application entitled "PORTABLE INFORMATION STORAGE MODULE FOR INFORMATION SHOPPING" having Attorney Docket No. HP PDNO 10002307-1 filed herewith.

THE FIELD OF THE INVENTION

[0002] The present invention relates generally to portable information storage and, in particular, to portable entertainment media storage devices.

BACKGROUND OF THE INVENTION

[0003] With the widespread availability of entertainment media such as movies and music, consumers are growing accustomed to having complete choice in their entertainment. Unfortunately, in some venues, consumers remain a captive audience to entertainment choices made by other people. For example, those traveling long distances frequently travel by airplane. On longer flights, entertainment is provided by the airline in the form of music or movies. However, passengers have little or no say regarding the selection of the in-flight movie shown on board. Passengers experience a broad range of interest associated with the selected movie, ranging anywhere from complete boredom to staunch disinterest. Finally, these experiences with in-flight movies is generally extendable to other forms of travel such as train, automobile, ferry, etc.

[0004] The entertainment industry is constantly looking for more ways to make movies and music readily available. Easy access to desired entertainment media increases the profit made on a given movie or musical piece. Accordingly, given the immense demand, satisfying the desire for choice among weary travelers is ripe for exploitation.

SUMMARY OF THE INVENTION

[0005] The present invention provides a personal movie storage module including a storage device having an atomic resolution storage device memory component capable of storing at least one movie. A communication interface communicates to and from the memory component of the storage module.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a schematic illustration of a personal movie storage module and an accompanying system of a movie playback device and a movie purchase center for use with the module, according to an embodiment of the present invention.

[0007] FIG. 2 is a schematic illustration of a movie library purchase center, according to an embodiment of the present invention.

[0008] FIG. 3 is a schematic illustration of a personal movie storage module, according to an embodiment of the present invention.

[0009] FIG. 4 is a side view illustrating one exemplary embodiment of a storage device used in a personal movie storage module in accordance with the present invention.

[0010] FIG. 5 is a simplified schematic diagram illustrating one exemplary embodiment of storing information within the storage device illustrated in FIG. 4.

[0011] FIG. 6 is a top view illustrating one exemplary embodiment of a storage device used in a personal movie storage module as shown in FIG. 4.

[0012] FIG. 7 is a diagram illustrating one exemplary embodiment of field emitters reading from storage areas of the storage device of FIG. 4.

[0013] FIG. 8 is schematic illustration of a portable movie storage module arranged in association with multiple playback devices and an alternative movie purchase source, according to an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims.

[0015] A personal movie storage module of the present invention allows an individual to purchase and store a movie into the module for later retrieval and viewing. The module includes a high capacity memory device and a communication interface. The memory device is capable of storing one or more movies while the communication interface facilitates communicating to and from the memory device at a high transfer rate.

[0016] In one example embodiment, using the module, an individual can capture a packet of entertainment media, such as a movie from a purchase center, such as a kiosk in an airport. The movie is viewed from the module at the individual's convenience using a personal playback device (e.g., DVD-type player, notebook computer, etc.). This feature enables the individual to select what movie they want to watch, and then view that movie at their discretion, thereby permitting a traveler autonomy in selecting their entertainment while traveling.

[0017] In one preferred embodiment, the memory device includes an atomic resolution storage device. Alternatively, the memory device optionally another suitable high capacity storage device. The atomic resolution storage device used in the personal movie storage module according to the present invention is subminiature in size, allowing it to be contained within a small housing, has low power requirements, and provides for non-volatile storage of large amounts of data, including video. The term "atomic resolution storage device" memory as used herein is defined as a non-volatile memory storage device capable of storing a large volume of data, such as megabytes to gigabytes of data points, within a relatively small storage area and requiring very low power consumption. The atomic resolution storage device includes a field emitter, a storage medium, and a micromover and associated circuitry for the reading and writing of data. Preferably, the atomic resolution storage device includes a

plurality of spaced apart field emitters, wherein each field emitter is responsible for a number of storage areas on the storage medium.

[0018] A personal movie storage module 10 of the present invention is shown generally in FIG. 1 along with movie purchase center 12 (e.g., a kiosk in an airport), central movie database 14, and personal playback device 16. Together, these elements form a system of purchasing a movie, storing and transporting the movie, and viewing the movie, with all of these acts performed at the discretion of the consumer.

[0019] Purchase center 12 further includes video display 20, keypad 22, and slots 24 for receiving personal movie storage module 10 while playback device 16 further includes video display 26, audio component 28 and slot 30 for receiving personal movie storage module 10.

[0020] Purchase center 12 preferably is available at a shopping center, airport, or other public venue, and hosts a large selection of audio and video formats of books, music, movies and/or other entertainment media for purchase via module 10. For example, a user could purchase a movie from purchase center 12 using a credit card and store the movie in personal movie storage module 10. In particular, using display 20 and keypad 22 of purchase center 12, the user purchases one or more selections of an entertainment media (e.g., a movie). A copy of that selection is transferred from purchase center 12 (e.g., downloaded) via communication slot 24 for storage into personal movie storage module 10. The selection is preferably downloaded in a broadband communication format from central movie database 14.

[0021] FIG. 2 is a schematic illustration of purchase center 12. As shown in FIG. 2, purchase center 12 includes previously identified display 20, keypad 22, slot 24 and also further includes communication interface 40, local memory 42, and controller 44. Video display 20 provides information about the selection of available movies, pricing, and order status. Display 20 also can provide previews of movies to attract consumer interest. Keypad 22 permits the user to select a movie and complete a purchase of the movie. Keypad 22 optionally includes a known credit card point of purchase device. Communication interface 40 governs communication between purchase center 12 and module 10 as well as between purchase center 12 and central movie database 14. As previously shown in FIG. 1, purchase center 12 (e.g., kiosk) is in broadband communication with central movie database 14. Finally, local memory 42 permits on-site storage of some movies, menus of selectable movies, pricing information, and purchasing programs. On-site storage of some movies is useful where purchase center 12 operates independently of central movie database or where some movies are ordered so frequently that those movies are stored locally in memory 42 of purchase center 12 to permit more direct downloading to module 10.

[0022] To use the system, the consumer approaches purchase center 12 (e.g. kiosk) and uses display 20 and keypad 22 to select a movie for purchase. The user places their personal movie storage module 10 into slot 24 of purchase center 12. Alternatively, purchase center 12 can provide a personal movie storage module 10 in slot 24 for purchase or rental by the consumer. Next, a selected movie is downloaded from central movie database 14 via purchase center 12 onto personal movie storage module 10. Since download

times take more than a few minutes, purchase center 12 can offer personal movie storage modules 10 for sale that already have a movie stored on the module 10. Similarly, when the purchasing environment is an airport, the consumer can order a movie at the time they book their airline tickets and the airline would then provide the user with a personal movie storage module having the selected movie. In this latter case, purchase center 12 is bypassed altogether.

[0023] Once the desired movie is captured on personal movie storage module 10, the consumer inserts module 10 into slot 30 of personal playback device 16 for viewing the movie through video display 26 and audio portion 28. Playback device 16 is portable to allow viewing the movie almost anywhere and at anytime.

[0024] During purchase of the movie, purchase center 12 encodes personal movie storage module 10 with instructions to either allow unlimited viewing of the movie, or to limit viewing to a finite number of viewings or to a finite period of time (e.g. 24 hours). Of course, these procedures as well as other procedures known in the art can be implemented to protect intellectual property (e.g., copyright) in the movie and to insure a secure correlation between the purchase price and the number of viewings.

[0025] Finally, personal movie storage module 10 has an extremely large memory, as will be further described later in this application. Accordingly, more than one movie can be stored in module 10 at one time and this type of memory permits repeated storage of movies. In one example, after a limited-viewing movie no longer can be viewed, this movie is deleted from module 10 upon the next instance that personal movie storage module 10 is placed in purchase center 12. This feature permits the consumer to reuse module 10 while the owners of the purchase center and owners of the copyright can regulate pricing and security.

[0026] FIG. 3 is a schematic illustration of module 10 showing further details about module 10. Module 10 further includes memory 50, communication interface 52, and power supply 54. Communication interface 50 includes connector 55. Communication interface 50 permits communication between module 10 and purchase center 12 and between module 10 and playback device 16. Connector 55 is in electrical communication with communication interface 52 and preferably includes an array of contact pins for establishing coupled communication with slot 24 of purchase center 12 and/or with slot 30 of playback device 16.

[0027] Memory 50 of personal movie storage module 10 further includes optional controller 56 for facilitating control of module 10 and/or of other devices used in association with module 10. Memory or storage device 50 of module 10 is preferably a high capacity storage device, and which is more preferably of a silicon-based construction. In one preferred embodiment, memory 50 is an atomic resolution storage (ARS) device capable of storing a large volume of data, such as megabytes to gigabytes of data points, within a relatively small storage area. The atomic resolution storage device is a low power consumption storage device. In one embodiment, the atomic resolution storage device requires less than 500 mW to operate. In one preferred embodiment, the ARS device of memory 50 has a size of about 1 square millimeter, suitable to be carried within the personal movie storage module 10. In addition, ARS module can include its own modules that correspond to the functions of optional

logic controller 56. Finally, other subminiature memory devices, known to those skilled in the art, that have a high storage capacity with relatively low power consumption can be used in place of ARS module. However, these alternative devices may limit the volume and quality of data recorded since these devices will not be as beneficial as ARS module of memory 50 relative to the power consumption requirements and amount of memory storage.

[0028] One atomic resolution storage device suitable for use in portable entertainment media module according to the present invention is disclosed in U.S. Pat. No. 5,557,596 to Gibson et al., issued Sep. 17, 1996, entitled "Ultra-High Density Storage Device." Other suitable high density storage devices suitable for use as memory 50 with personal movie storage module according to the present invention will become apparent to those skilled in the art after reading the present application. One exemplary embodiment of a suitable high density storage device (i.e., atomic resolution storage device) suitable for use as memory 50 with personal movie storage module according to the present invention is disclosed in further detail later in this application. Memory 50 is especially suitable for storing many different types of entertainment media such as books, music, movies, etc. The entertainment media can be pre-loaded onto memory 50 so that a purchase of module 10 already includes the desired entertainment media, e.g. a music CD or book. Alternatively, module 10 can be used to capture and store the desired entertainment media by choosing the desired selection from purchase center 12 and transferring a copy of the selection into memory 50 of module 10 for later retrieval with playback device 16. Since memory 50 is so large, multiple entertainment media are loadable into memory 50, thereby permitting repeated use of module 10.

[0029] FIGS. 4 through 7 disclose one exemplary embodiment of an atomic resolution storage device of memory 50 capable of storing megabytes to gigabytes of information in a small storage area. For a further discussion of an atomic resolution storage device, see U.S. Pat. No. 5,557,596, entitled, "Ultra-High Density Storage Device", by Gibson et al. and assigned to Hewlett-Packard Company, which is incorporated herein by reference.

[0030] FIG. 4 illustrates a side cross-sectional view of storage device 100. Storage device 100 is one exemplary embodiment of memory 50 of personal movie storage module 10. Storage device 100 includes a number of field emitters, such as field emitters 102 and 104, storage medium 106 including a number of storage areas, such as storage area 108, and micromover 110. Micromover 110 scans storage medium 106 with respect to the field emitters or vice versa. In one preferred embodiment, each storage area is responsible for storing one bit of information.

[0031] In one embodiment, the field emitters are point emitters having relatively very sharp points. Each point emitter may have a radius of curvature in the range of approximately 1 nanometer to hundreds of nanometers. During operation, a pre-selected potential difference is applied between a field emitter and its corresponding gate, such as between field emitter 102 and gate 103 surrounding it. Due to the sharp point of the emitter, an electron beam current is extracted from the emitter towards the storage area. Depending on the distance between the emitters and the storage medium 106, the type of emitters, and the spot

size (bit size) required, electron optics may be utilized to focus the electron beams. A voltage may also be applied to the storage medium 106 to either accelerate or decelerate the field-emitted electrons or to aid in focusing the field-emitted electrons.

[0032] In one embodiment, casing 120 maintains storage medium 106 in a partial vacuum, such as at least 10^{-5} torr. It is known in the art to fabricate such types of microfabricated field emitters in vacuum cavities using semiconductor processing techniques. See, for example, "Silicon Field Emission Transistors and Diodes," by Jones, published in IEEE Transactions on Components, Hybrids and Manufacturing Technology, 15, page 1051, 1992.

[0033] In the embodiment shown in FIG. 4, each field emitter has a corresponding storage area. In another embodiment, each field emitter is responsible for a number of storage areas. As micromover 110 scans storage medium 106 to different locations, each emitter is positioned above different storage areas. With micromover 110, an array of field emitters can scan over storage medium 106.

[0034] As will be described, the field emitters are responsible to read and write information on the storage areas by means of the electron beams they produce. Thus, field emitters suitable for use in storage device 100 are the type that can produce electron beams that are narrow enough to achieve the desired bit density on the storage medium, and can provide the power density of the beam current needed for reading from and writing to the medium. A variety of ways are known in the art that are suitable to make such field emitters. For example, one method is disclosed in "Physical Properties of Thin-Film Field Emission Cathodes With Molybdenum Cones," by Spindt et al, published in the Journal of Applied Physics, Vol. 47, No. 12, December 1976. Another method is disclosed in "Fabrication and Characteristics of Si Field Emitter Arrays," by Betsui, published in Tech. Digest 4th Int. Vacuum Microelectronics Conf., Nagahama, Japan, page 26, 1991.

[0035] In one embodiment, there can be a two-dimensional array of emitters, such as 100 by 100 emitters, with an emitter pitch of 50 micrometers in both the X and the Y directions. Each emitter may access tens of thousands to hundreds of millions of storage areas. For example, the emitters scan over the storage areas with a periodicity of about 1 to 100 nanometers between any two storage areas. Also, all of the emitters may be addressed simultaneously or sequentially in a multiplexed manner. Such a parallel accessing scheme significantly reduces access time, and increases data rate of the storage device.

[0036] FIG. 5 shows the top view of storage medium 100 having a two-dimensional array of storage areas and a two-dimensional array of emitters. Addressing the storage areas requires external circuits. One embodiment to reduce the number of external circuits is to separate the storage medium into rows, such as rows 140 and 142, where each row contains a number of storage areas. Each emitter is responsible for a number of rows. However, in this embodiment, each emitter is not responsible for the entire length of the rows. For example, emitter 102 is responsible for the storage areas within rows 140 through 142, and within columns 144 through 146. All rows of storage areas accessed by one emitter are connected to one external circuit. To address a storage area, one activates the emitter responsible

for that storage area and moves that emitter by means of the micromover 110 (shown in FIG. 4) to that storage area. The external circuit connected to the rows of storage areas within which that storage area lies is activated.

[0037] Micromover 110 can also be fabricated in a variety of ways, as long as it has sufficient range and resolution to position the field emitters over the storage areas. As a conceptual example, micromover 110 is fabricated by standard semiconductor microfabrication process to scan storage medium 106 in the X and Y directions with respect to casing 120.

[0038] FIG. 6 shows the top view of the storage medium 106, (shown in FIG. 4) held by two sets of thin-walled microfabricated beam-like structural members, 112, 114, 116, 120. The faces of the first set of thin-walled beams are in the Y-Z plane, such as 112 and 114. Thin-walled beams 112 and 114 may be flexed in the X direction allowing storage medium 106 to move in the X direction with respect to casing 120. The faces of the second set of thin-walled beams are in the X-Z plane, such as 116 and 118. Thin-walled beams 116 and 118 allow storage medium 106 to move in the Y direction with respect to casing 120. Storage medium 106 is held by the first set of beams, which are connected to frame 122. Frame 122 is held by the second set of beams, which are connected to casing 120. The field emitters scan over storage medium 106, or storage medium 106 scans over the field emitters in the X-Y directions by electrostatic, electromagnetic, piezoelectric, or other means known in the art. In this example, micromover 110 moves storage medium 106 relative to the field emitters. A general discussion of such microfabricated micromover can be found, for example, in "Novel Polysilicon Comb Actuators for XY-Stages," published in the Proceeding of MicroElectro Mechanical Systems 1992, written by Jaecklin et al.; and in "Silicon Micromechanics: Sensors and Actuators on a Chip", by Howe et al., published in IEEE Spectrum, page 29, in July 1990.

[0039] In another embodiment, electron beams are scanned over the surface of storage medium 106 by either electrostatically or electromagnetically deflecting them, such as by electrostatic deflectors or electrodes 125 (shown in FIG. 4) positioned adjacent to emitter 104. Many different approaches to deflect electron beams can be found in literature on Scanning Electron Microscopy and will not be further described in this specification.

[0040] In one method, writing is accomplished by temporarily increasing the power density of the electron beam current to modify the surface state of the storage area. Reading is accomplished by observing the effect of the storage area on the electron beams, or the effect of the electron beams on the storage area. For example, a storage area that has been modified can represent a bit 1, and a storage area that has not been modified can represent a bit 0, and vice versa. In fact, the storage area can be modified to different degrees to represent more than two bits. Some modifications may be permanent, and some modifications may be reversible. The permanently modified storage medium is suitable for write-once-read-many memory (WORM).

[0041] In one embodiment, the basic idea is to alter the structure of the storage area in such a way as to vary its secondary electron emission coefficient (SEEC), its back-

scattered electron coefficient (BEC), or the collection efficiency for secondary or back-scattered electrons emanating from the storage area. The SEEC is defined as the number of secondary electrons generated from the medium for each electron incident onto the surface of the medium. The BEC is defined as the fraction of the incident electrons that are scattered back from the medium. The collection efficiency for secondary/back-scattered electrons is the fraction of the secondary/back-scattered electrons that is collected by an electron collector, typically registered in the form of a current.

[0042] Reading is typically accomplished by collecting the secondary and/or back-scattered electrons when an electron beam with a lower power density is applied to storage medium 106. During reading, the power density of the electron beam should be kept low enough so that no further writing occurs.

[0043] One embodiment of storage medium 106 includes a material whose structural state can be changed from crystalline to amorphous by electron beams. The amorphous state has a different SEEC and BEC than the crystalline state, which leads to a different number of secondary and back-scattered electrons emitted from the storage area. By measuring the number of secondary and back-scattered scattered electrons, one can determine the stage of the storage area. To change from the amorphous to crystalline state, one increases the beam power density and then slowly decreases it. This heats up the amorphous and then slowly cools it so that the area has time to anneal into its crystalline state. To change from crystalline to amorphous state, one increases the beam power density to a high level and then rapidly decreases the beam power. To read from the storage medium, a lower-energy beam strikes the storage area. An example of such type of material is germanium telluride (GeTe) and ternary alloys based on GeTe. Similar methods to modify states using laser beams as the heating source have been described in "Laser-induced Crystallization of Amorphous GeTe: A Time-Resolved Study," by Huber and Marinero, published in Physics Review B 36, page 1595, in 1987, and will not be further described here.

[0044] There are many preferred ways to induce a state change in storage medium 106. For example, a change in the topography of the medium, such as a hole or bump, will modify the SEEC and BEC of the storage medium. This modification occurs because the coefficients typically depend on the incident angle of the electron beam onto the storage area. Changes in material properties, band structure, and crystallography may also affect the coefficients. Also, the BEC depends on an atomic number, Z. Thus, one preferred storage medium has a layer of low Z material on top of a layer of high Z material or vice versa, with writing accomplished through ablating some of the top layer by an electron beam.

[0045] FIG. 7 shows schematically the field emitters reading from storage medium 106. The state of storage area 150 has been altered, while the state of storage area 108 has not been altered. When electrons bombard a storage area, both secondary electrons and back-scattered electrons will be collected by the electron collectors, such as electron collector 152. An area that has been modified will produce a different number of secondary electrons and back-scattered electrons, as compared to an area that has not been modified.

The difference may be more or may be less depending on the type of material and the type of modification. By monitoring the magnitude of the signal current collected by electron collectors 152, one can identify the state of and, in turn, the bit stored in, the storage area.

[0046] Field emitters may be noisy with the magnitude of the electron beam current varying with respect to time. Moreover, the gap distance between the tips of the emitters and the surface of the storage medium may vary. If the information stored were based on tunneling current, then the gap distance may be extremely crucial. However, the application presently disclosed depends on field emitters, and not directly on the emitted electron beam current, but rather on the effect of the beam. At least two ways may be used to alleviate the problem of the emitters being noisy. One way is to connect constant current source 154 to field emitter 102. This source will control the power density of electron beam current beam 156. Although this method would not help storage techniques using the magnitude of the field emitted current as the signal, this method reduces the field emitter noise significantly. Another way to alleviate the field-emitter noise is to separately measure the emitted electron beam current and use it to normalize the signal current. As the electron beam current varies, the signal current varies correspondingly. On the other hand, the normalized signal current remains the same to indicate the state of the storage area.

[0047] As shown in FIG. 8, additional playback devices for use with personal movie storage module 10 of the present invention comprise notebook computer 200, seatback viewer 210, personal movie player 230.

[0048] Among other well known features of notebook computer 200 such as video display 202, audio speaker 204, keypad 205, computer 200 also includes slot 206 for receiving personal movie storage module 10. Seatback player system 210 includes seatback 211, video display 212, audio headset 214, slot 216 for receiving personal movie storage module 10, and optional armrest audio supply 218. Finally, personal playback device 230 further includes video display 232, audio headset 234, and slot 236 for receiving personal movie storage module 10.

[0049] Since many consumers of entertainment media already have notebook computers (or even desktop computers), entertainment media stored on module 10, such as a movie, can be enjoyed using notebook computer 200. For example, a movie stored in personal movie storage module 10 is viewed in display 202 and heard in speakers 204 of computer 200 while keypad 205 is used to manipulate display 202, speakers 204 and/or operation of module 10. Using known voice recognition technology, microphone 203 optionally is used to control these functions and components. Slot 206 comprises an industry standard communication pathway to permit memory 50 of personal movie storage module 10 to communicate with the identified components and functions of notebook computer 200.

[0050] Personal movie storage module 10 is ideal for use in the travel industry. Accordingly, various types of transportation which include multiple person seating will incorporate playback systems into their seating. For example, as shown in FIG. 8, an airplane, commuter train, and minivan, as well as other transportation modes can include seats having a seatback player 210 built into the back of every

seat. Accordingly, once the traveler is seated, personal movie storage module 10 is placed in slot 216 and played for viewing on video display 212 mounted on seatback 211 (e.g. stationed in front of the seated traveler) and listened to with audio headset 214 extending from seatback 211. Alternatively, audio headset 214 can extend from arm rest audio supply 218. The convenience of seatback-type playback devices will enable a consumer to use personal movie storage module 10 for viewing movies without having to bring their own personal playback device or to purchase a personal playback device.

[0051] Finally, personal playback device 230 is available for those wanting a dedicated portable device for viewing movies stored on personal movie storage module 10. In use, module 10 is placed in slot 236 to permit a controller and communication interface (not shown) in personal playback device 230 to display the movie on video display 232 and audio headset 234. Personal playback device 230 can be embodied in a conventional DVD movie player, or in a stand alone device independent of the DVD format.

[0052] Finally, FIG. 8 also shows a home point-of-purchase system 250 that can be used to select and download movies onto personal movie storage module 10. Home point-of-purchase system 250 includes cable/satellite/internet network 252 and cable receiver 254 with slot 256 for communicating with and for receiving personal movie storage module 10. In this use of personal movie storage module 10, a movie is purchased through a known pay-per-view system available through network 252 and downloaded into personal storage module 10 via receiver 254. After the movie is downloaded, the consumer removes personal movie storage module 10 from slot 256 of receiver 254 and takes module 10 with them for later viewing with a personal playback device 16. This allows the consumer to select and obtain their movie at their leisure before embarking on their journey.

[0053] A personal movie storage module of the present invention carries many advantageous features. Foremost, the module includes a high capacity memory component for storing large amounts of information such as movies, etc. in an extremely small space. This feature permits conveniently transporting an entertainment packet (e.g. a movie) in a virtually hands-free and almost weightless manner relative to transporting conventional formats such as a DVD. In addition, with the use of personal playback devices that are portable or built into the environment, the movie can be viewed at the consumer's discretion. The memory component of the module also can be re-used so that the module need not be thrown away after a single use. Finally, in the eyes of the entertainment-consuming individual, a personal movie storage module of the present invention enables the individual to have complete choice over what movies they watch and when they watch them while traveling.

[0054] Although specific embodiments have been illustrated and described herein for purposes of description of the preferred embodiment, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent implementations calculated to achieve the same purposes may be substituted for the specific embodiments shown and described without departing from the scope of the present invention. Those with skill in the chemical, mechanical, electromechanical, electrical, and computer arts

will readily appreciate that the present invention may be implemented in a very wide variety of embodiments. This application is intended to cover any adaptations or variations of the preferred embodiments discussed herein. Therefore, it is manifestly intended that this invention be limited only by the claims and the equivalents thereof.

What is claimed is:

1. A method of portably handling a movie comprising:
 - storing electronically readable movie into a personal movie storage module including an atomic resolution storage memory component; and
 - recalling selectively the movie from the memory component of the personal storage module into a personal movie playback device for viewing by a user.
2. The method of claim 1, wherein the storing step further includes:
 - transferring a copy of the movie from a movie purchase center into the memory component of the personal storage module.
3. The method of claim 2 and the transferring step further comprising:
 - downloading the movie from a remotely located centralized movie database.
4. The method of claim 1 and further comprising:
 - repeating the storing step to capture additional electronically readable movies into the memory component of the storage module.
5. The method of claim 1 wherein the recalling step further comprises the playback device including at least one of a notebook computer, a personal movie player, and a seatback-mounted movie viewer.
6. The method of claim 1 wherein, the storing step further comprises:
 - providing the storage module with a communication interface, and a power supply.
7. The method of claim 1 wherein the memory component further includes a controller logic for operating the storage device and communicating between the memory component and the communication interface.
8. The method of claim 1 and further comprising:
 - performing the storing step and the recalling step in a broadband frequency format.
9. A personal movie storage module comprising:
 - a storage device including an atomic resolution storage device memory component capable of storing at least one movie; and
 - a communication interface for communicating to and from the memory component of the storage module.
10. The module of claim 9, and further comprising a controller unit located on the atomic resolution storage device for operating the storage device and communicating between the memory component and the communication interface.
11. The module of claim 9, wherein the atomic resolution storage device further comprises:
 - a field emitter fabricated by semiconductor microfabrication techniques capable of generating an electron beam current; and

- a storage medium in proximity to the field emitter and having a storage area in one of a plurality of states to represent the information stored in the storage area.

12. The module of claim 11, wherein an effect is generated when the electron beam current bombards the storage area, wherein the magnitude of the effect depends upon the state of the storage area, and wherein the information stored in a storage area is read by measuring the magnitude of the effect.

13. The module of claim 11, further comprising:

- a plurality of storage areas on the storage medium, with each storage area being similar to the one recited in claim 11; and

- a microfabricated mover in the storage device to position different storage areas to be bombarded by the electron beam current.

14. The module of claim 13, further comprising:

- a plurality of field emitters, with each emitter being similar to the one recited in claim 11, the plurality of field emitters being spaced apart, with each emitter being responsible for a number of storage areas on the storage medium; and

such that a plurality of the field emitters can work in parallel to increase the data rate of the storage device.

15. The module of claim 9 further comprising:

- a housing which encloses the ultra-high capacity storage device and the communication interface.

16. A portable movie handling system comprising:

- a portable movie storage module comprising:

- an atomic resolution storage memory device of storing at least one movie; and

- a communication interface for communicating to and from the storage device;

- a purchase system permitting purchasable access to movies stored as electronically readable information including:

- a centralized movie database storing a collection of movies for downloading to multiple points-of purchase; and

- a point-of-purchase center for selectively transferring a copy of a selected movie from the centralized database to the memory device of the movie storage module; and

- a movie playback device for viewing movie from the storage memory device of the movie storage module.

17. The system of claim 15 wherein the playback device is at least one of a notebook computer, a seatback mounted movie viewer, and a personal portable playback device.

18. The system of claim 15 wherein the centralized movie database comprises a cable/satellite TV network and the point-of-purchase center comprises a cable/satellite TV receiver.

* * * * *



US005809145A

United States Patent [19]

Slik et al.

[11] Patent Number: **5,809,145**[45] Date of Patent: **Sep. 15, 1998**[54] **SYSTEM FOR DISTRIBUTING DIGITAL INFORMATION**

[75] Inventors: David Slik, Brackendale; Shannon Byrne, Whistler, both of Canada

[73] Assignee: Paradata Systems Inc., Canada

[21] Appl. No.: 670,846

[22] Filed: Jun. 28, 1996

[51] Int. Cl.⁶ H04K 1/00

[52] U.S. Cl. 380/25; 395/650

[58] Field of Search 380/4, 23, 25, 380/49, 21; 395/650, 239

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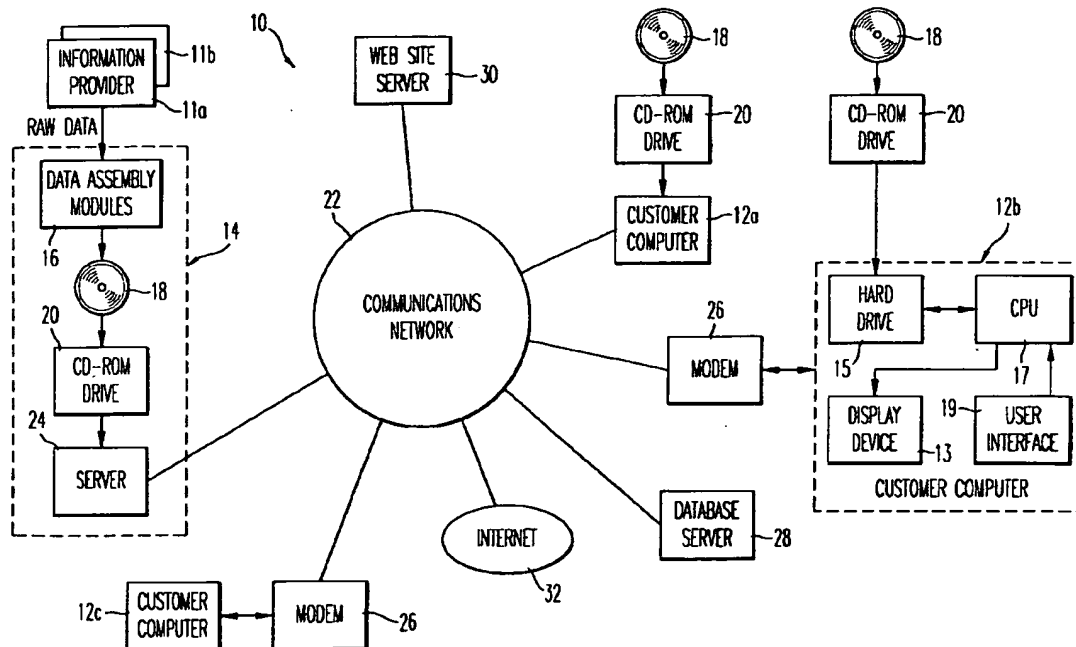
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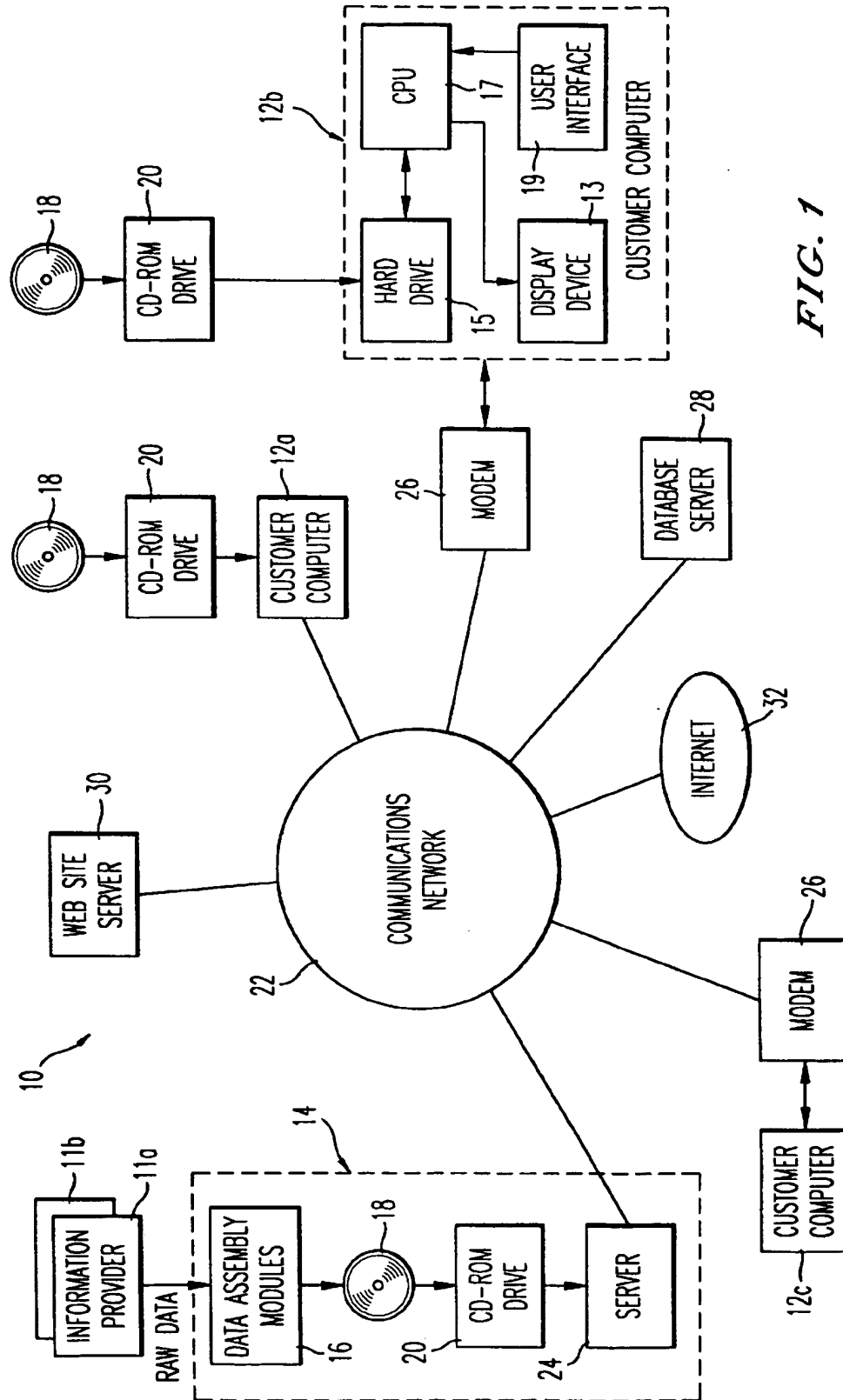
Primary Examiner—David C. Cain

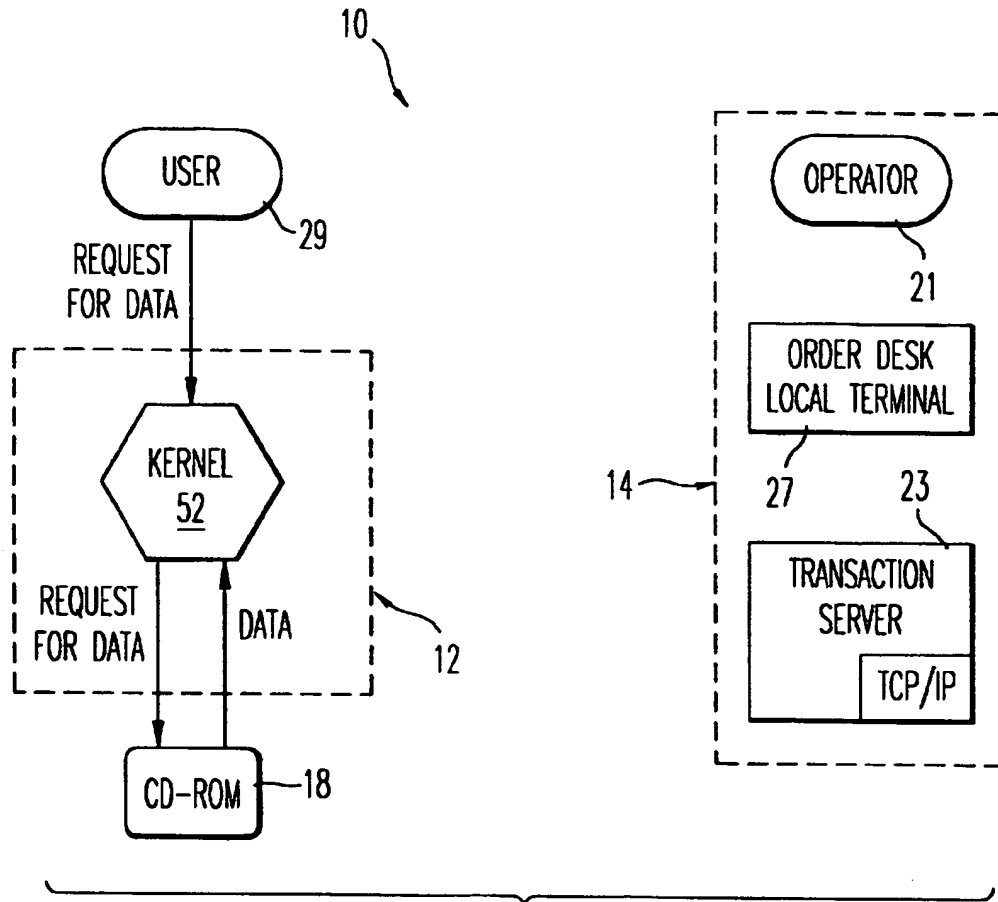
Attorney, Agent, or Firm—Roylance, Abrams, Berdo & Goodman, L.L.P.

[57] **ABSTRACT**

A system for distributing digital data among a plurality of customers is provided which comprises a modular software architecture to accommodate different data preview, search, data compression and encryption functions, and different purchase transactions. A software kernel creates an operating environment in conjunction with the host operating system of a customer computer to accommodate these different services and functions and allow for the storage and retrieval of datasets from a variety of storage locations, such as portable storage devices at customer computers and shared memory devices accessible via communication networks. Computer-dependent product codes for requesting datasets and release codes for decrypting datasets are generated to protect against unauthorized use of selected datasets.

34 Claims, 27 Drawing Sheets



*FIG. 2*

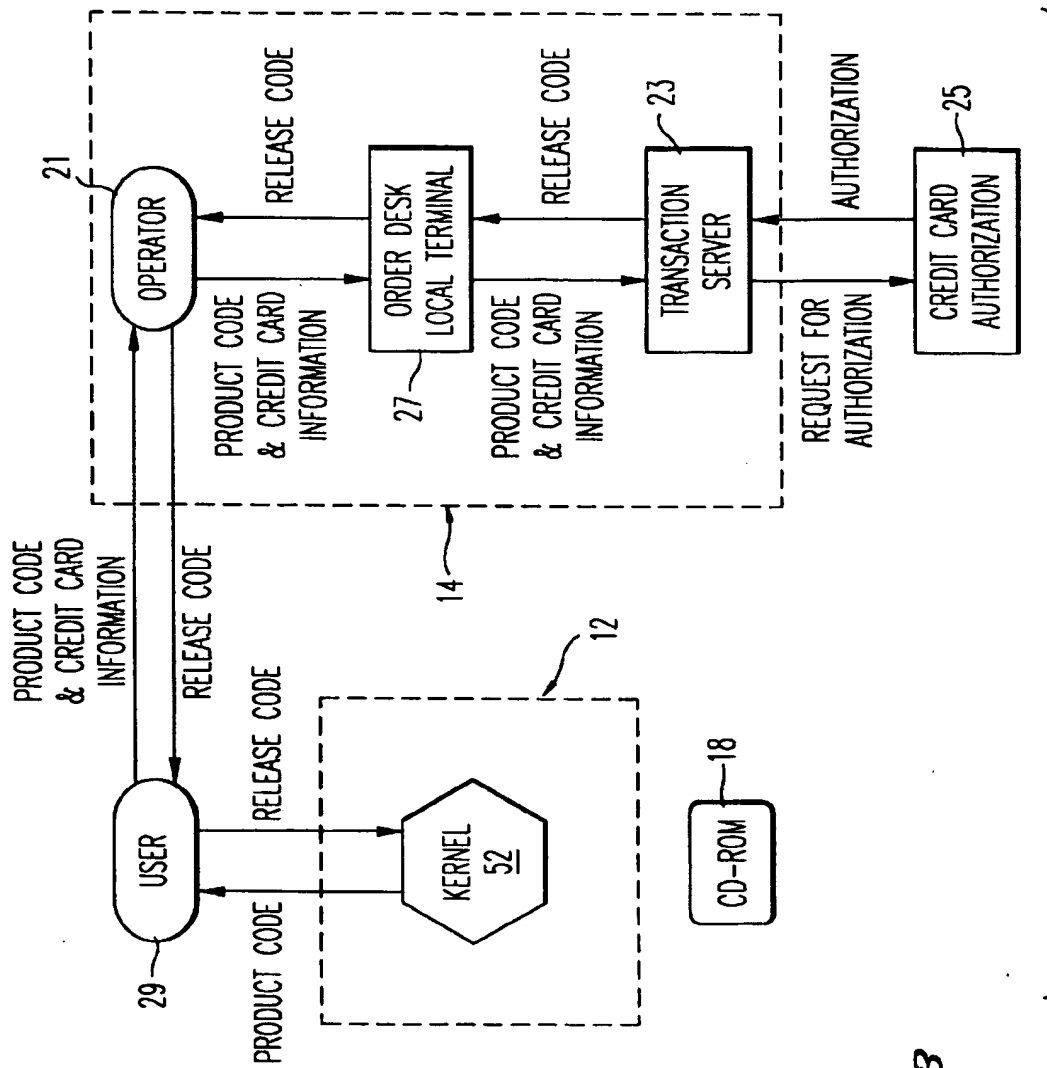


FIG. 3

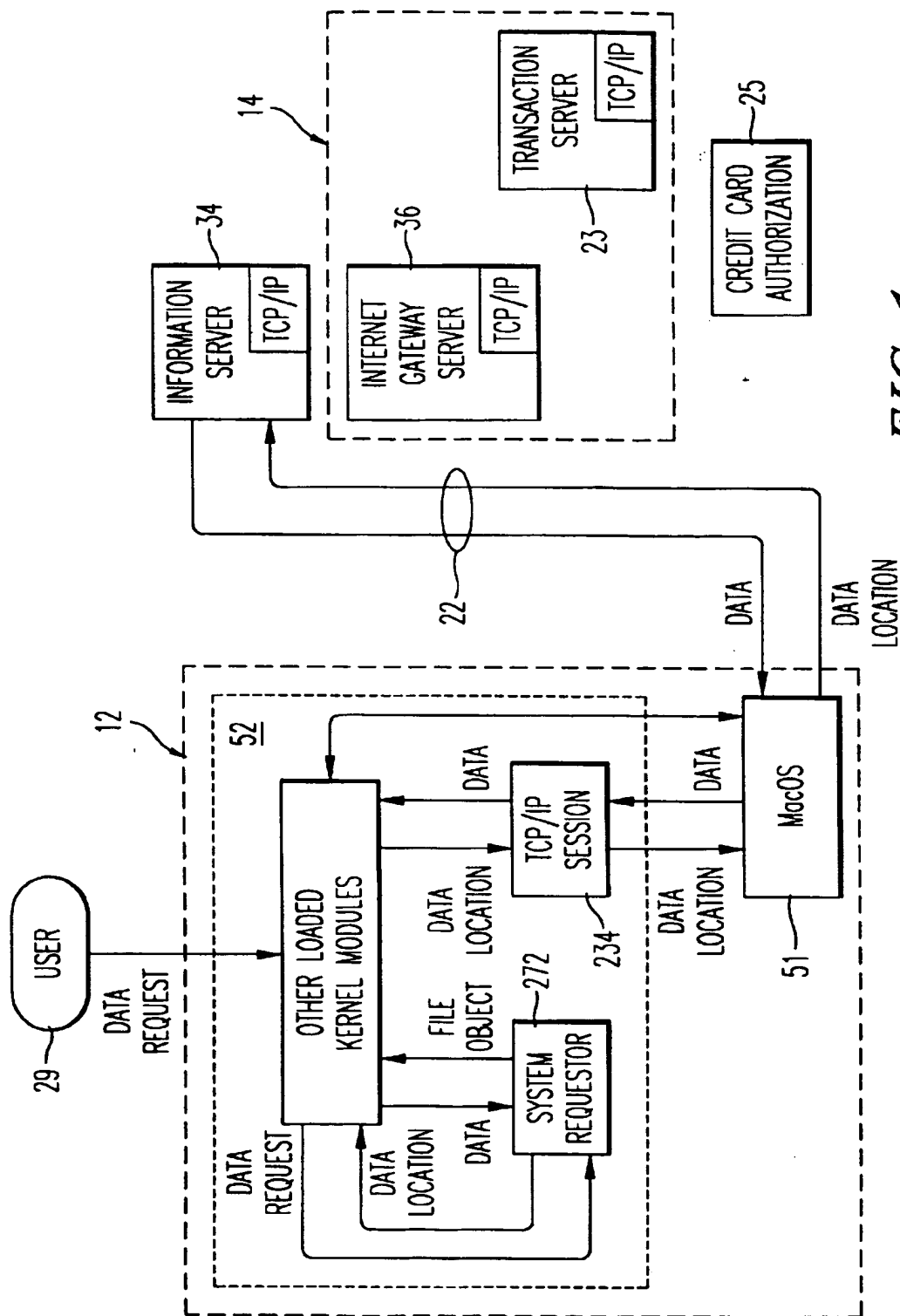


FIG. 4

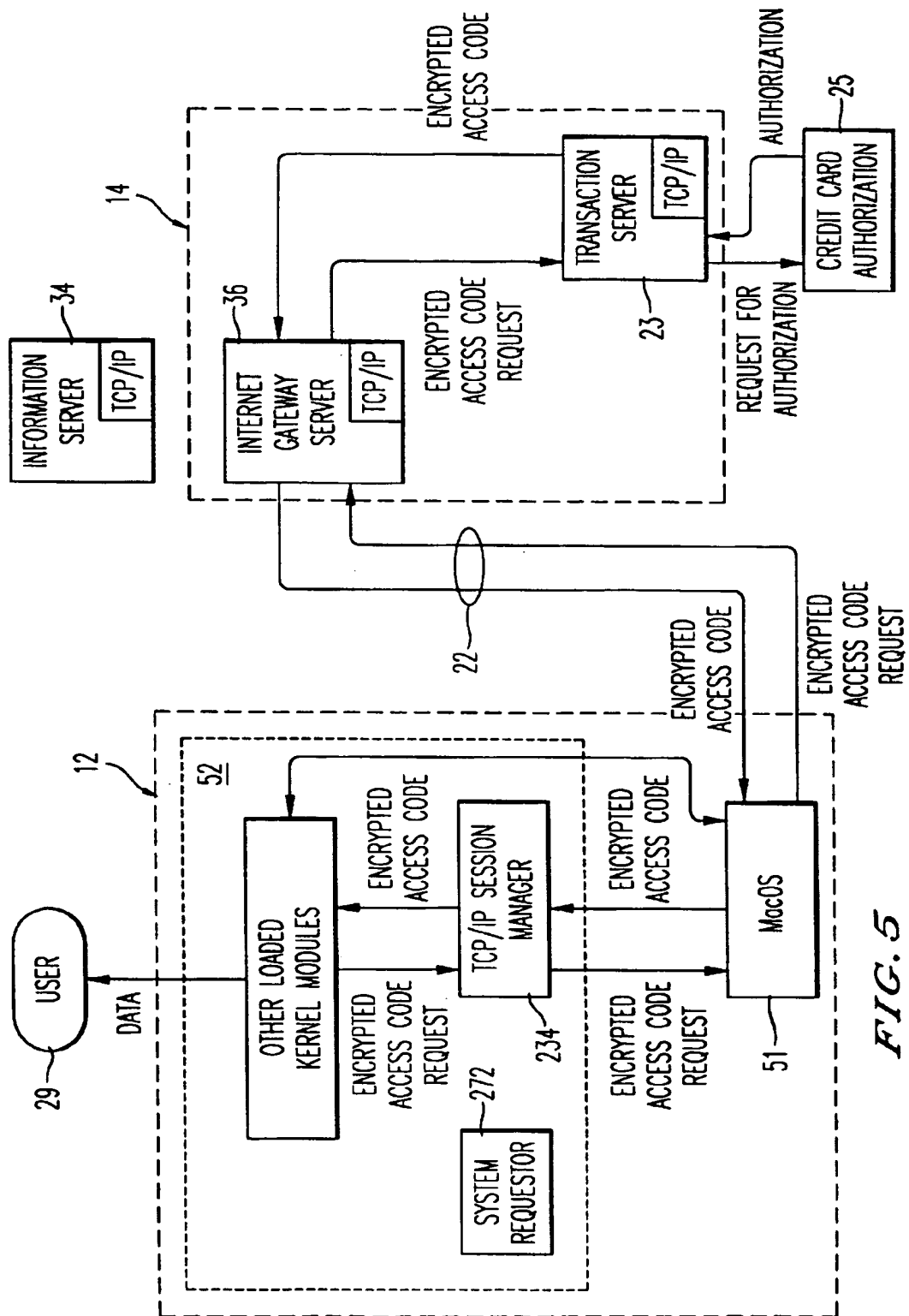
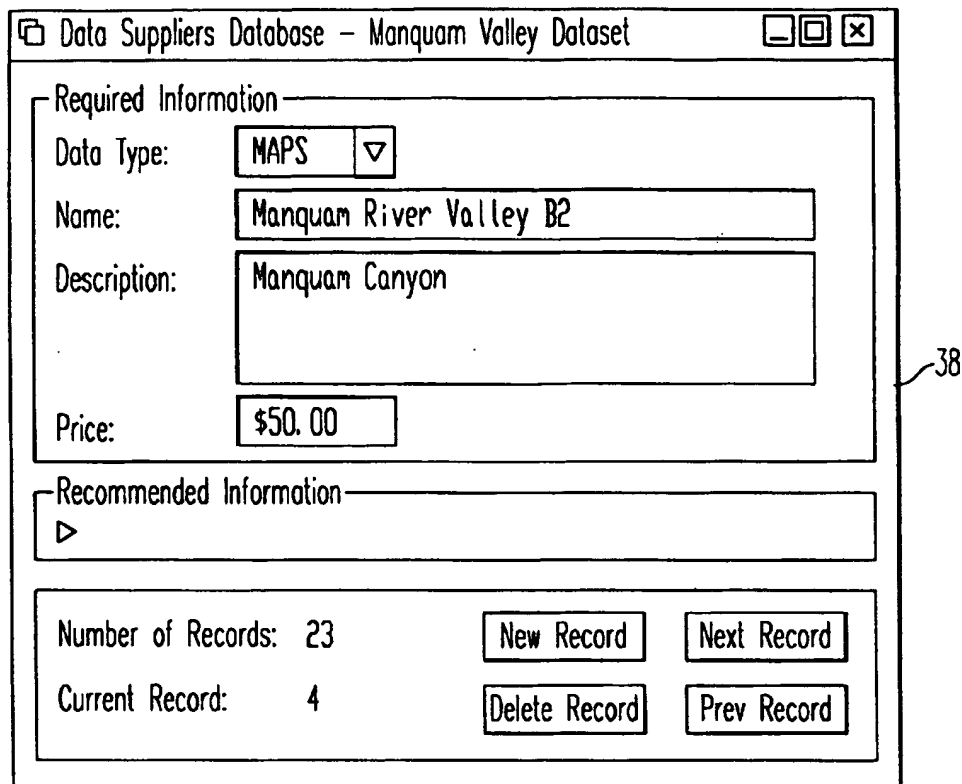


FIG. 5

A screenshot of a software window titled "Data Suppliers Database - Manquam Valley Dataset". The window contains two main sections: "Required Information" and "Recommended Information". The "Required Information" section has fields for "Data Type" (set to "MAPS"), "Name" (set to "Manquam River Valley B2"), "Description" (set to "Manquam Canyon"), and "Price" (set to "\$50.00"). The "Recommended Information" section is currently empty. At the bottom of the window, there are status fields showing "Number of Records: 23" and "Current Record: 4", along with four buttons: "New Record", "Next Record", "Delete Record", and "Prev Record". A reference numeral "38" points to the right side of the window.

Data Suppliers Database - Manquam Valley Dataset

Required Information

Data Type: MAPS

Name: Manquam River Valley B2

Description: Manquam Canyon

Price: \$50.00

Recommended Information

Number of Records: 23

Current Record: 4

New Record

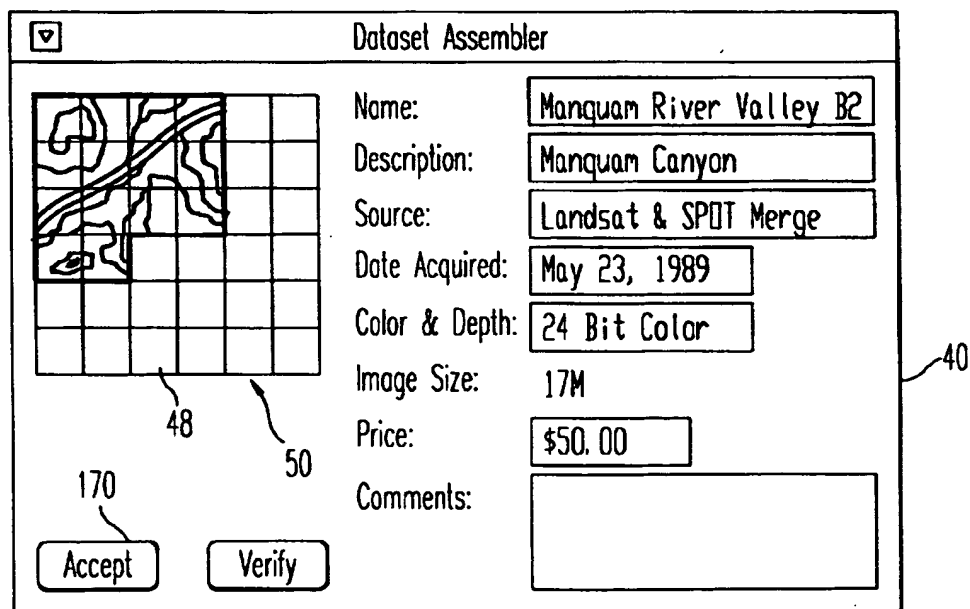
Next Record

Delete Record

Prev Record

38

FIG. 6

A screenshot of a software window titled "Dataset Assembler". On the left side, there is a grid of 16 cells (4 rows by 4 columns). The top-left cell contains a map of a river valley. Below the grid, there are two buttons: "Accept" and "Verify". On the right side of the window, there are several fields for dataset information: "Name" (set to "Manquam River Valley B2"), "Description" (set to "Manquam Canyon"), "Source" (set to "Landsat & SPOT Merge"), "Date Acquired" (set to "May 23, 1989"), "Color & Depth" (set to "24 Bit Color"), "Image Size" (set to "17M"), "Price" (set to "\$50.00"), and a "Comments" field. A reference numeral "40" points to the right side of the window. Other reference numerals include "48" pointing to the grid, "50" pointing to the "Accept" button, and "170" pointing to the "Verify" button.

Dataset Assembler

Name: Manquam River Valley B2

Description: Manquam Canyon

Source: Landsat & SPOT Merge

Date Acquired: May 23, 1989

Color & Depth: 24 Bit Color

Image Size: 17M

Price: \$50.00

Comments:

Accept

Verify

48

50

170

40

FIG. 7

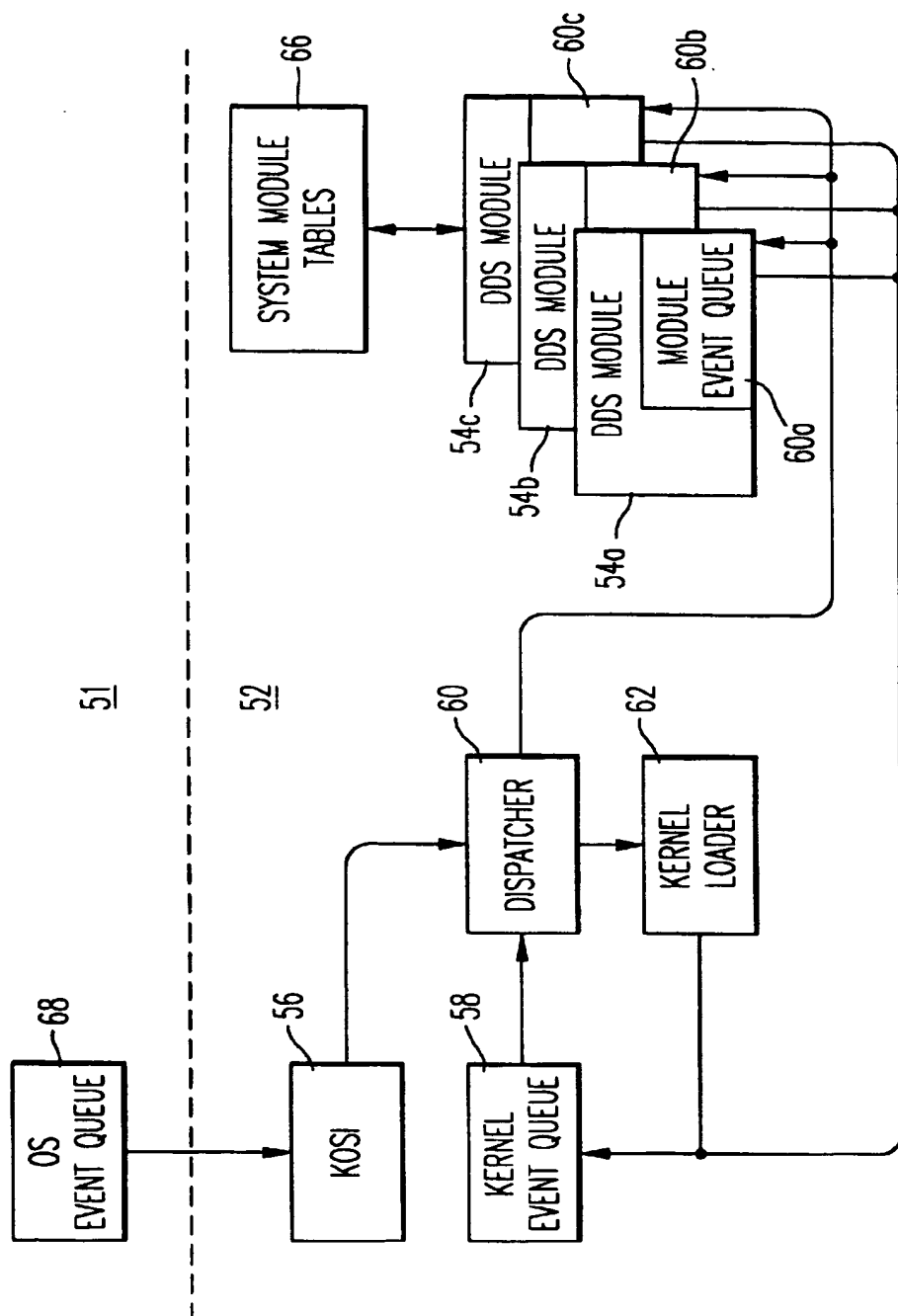
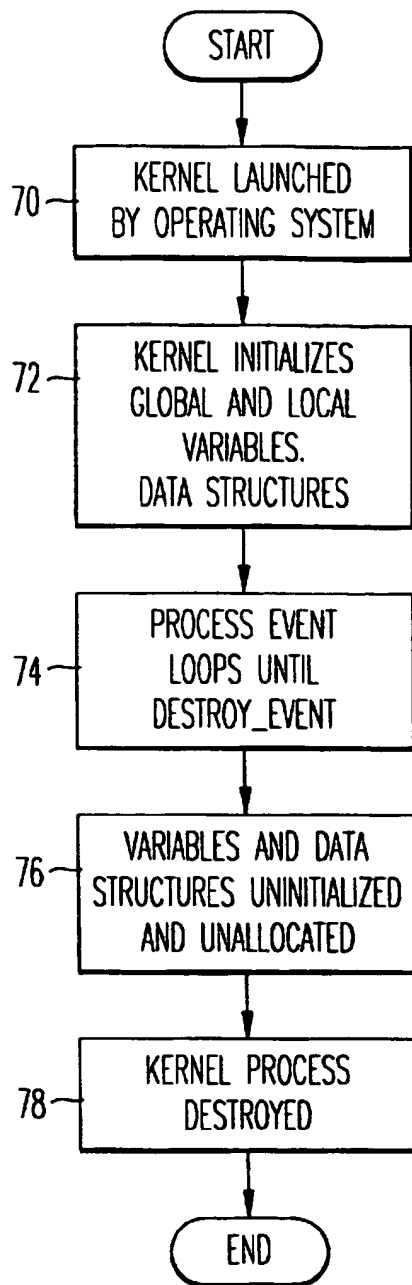


FIG. 8

**FIG. 9**

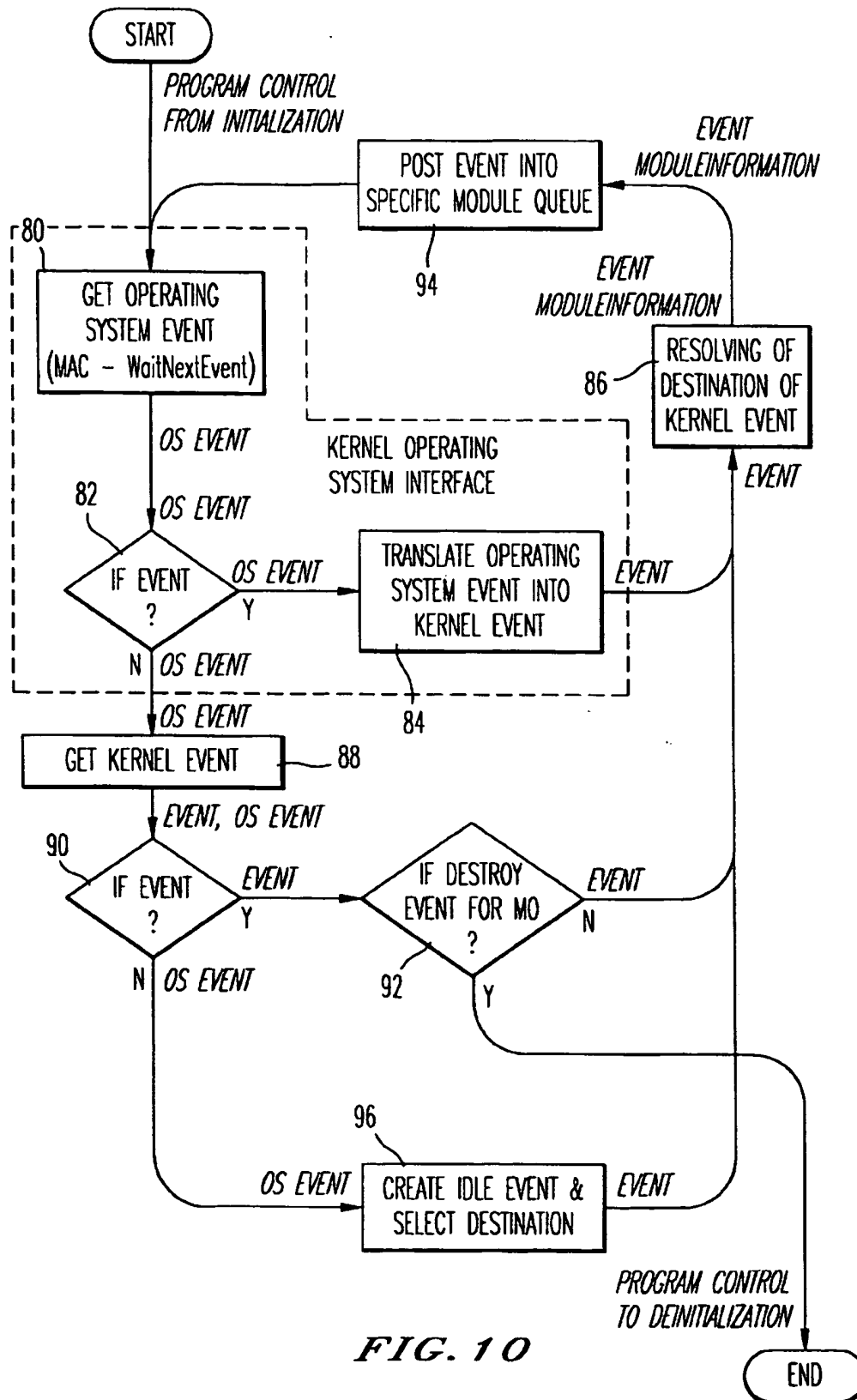
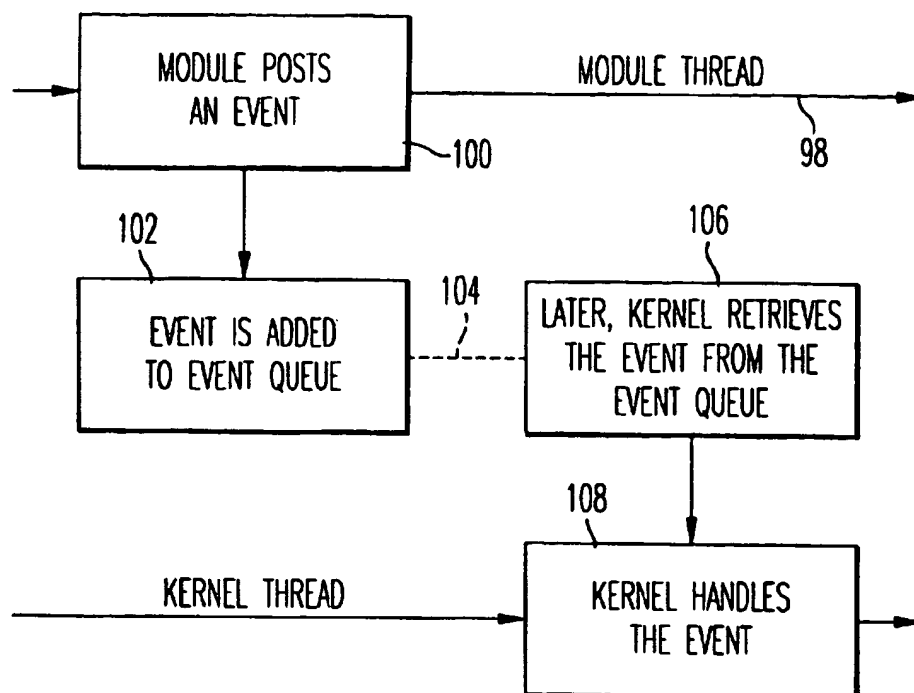
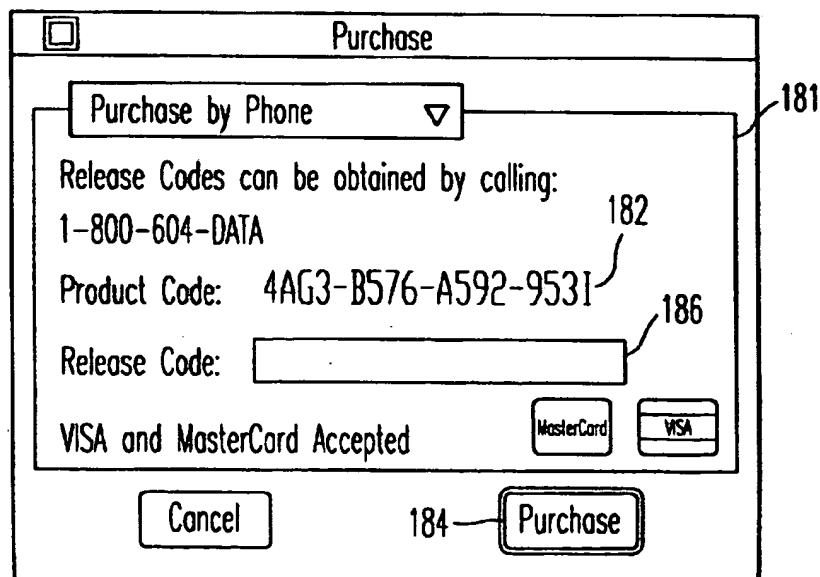


FIG. 10

*FIG. 11.**FIG. 16*

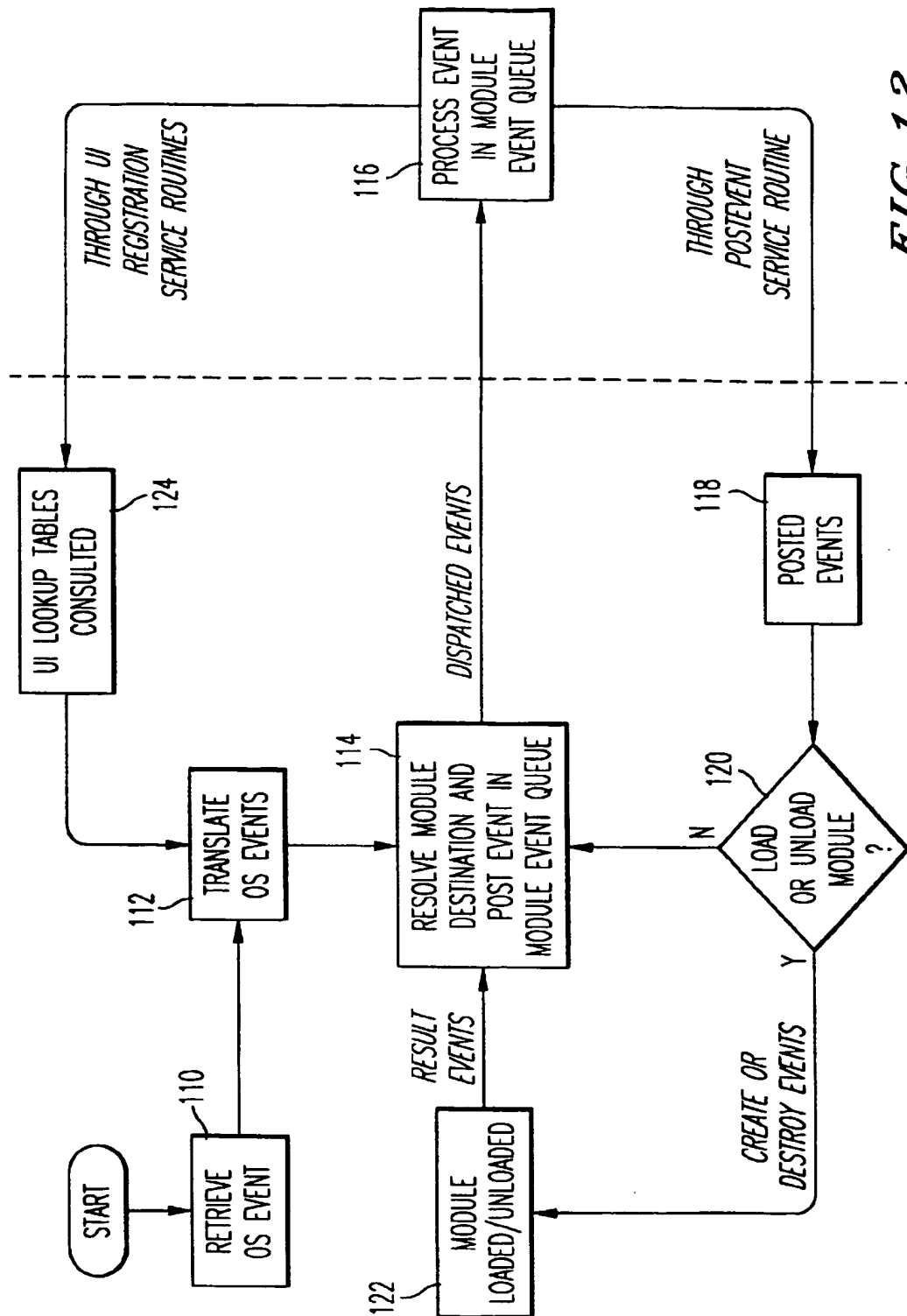


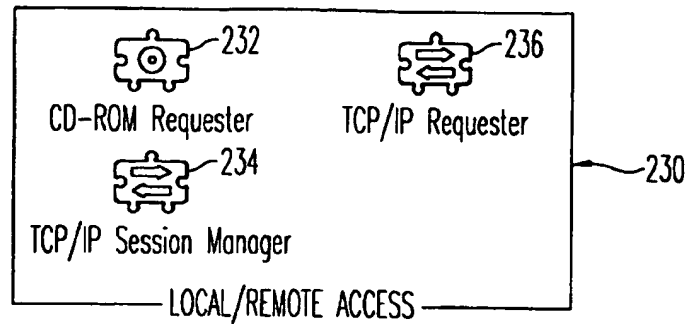
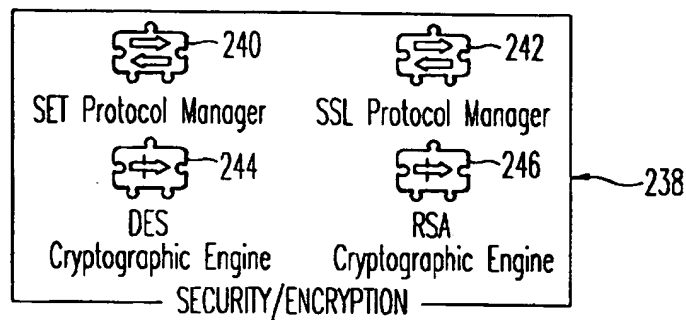
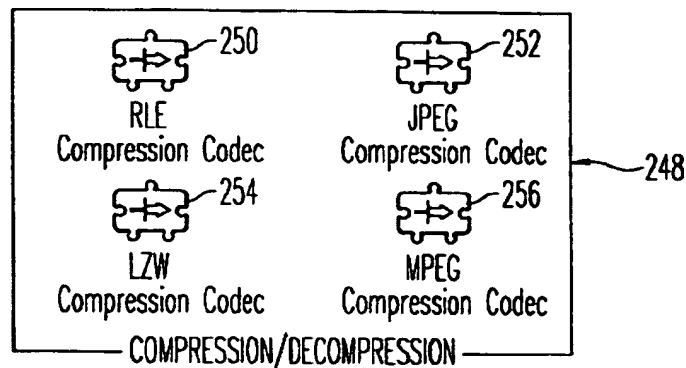
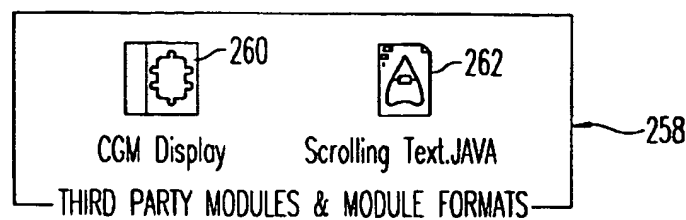
FIG. 12

☐ ☐ ☐ MIRR 'Startup Module' ID = 12975 from Module.rs

Module ID	12345	130
Storage Type	S15	132
Events Accepted Mask	S80	134
Module Version	S1A	136
Kernel Version Required	S1A	138
Module Checksum	0	140
Module Signature	0	142
Module Type	STAR	144
Module Data Type	NULL	146
Module Creator	PARA	148
Uses Local Resources	<input type="radio"/> 0 <input checked="" type="radio"/> 1	150
Has User Interface	<input checked="" type="radio"/> 0 <input type="radio"/> 1	152
Can Be Threaded	<input type="radio"/> 0 <input checked="" type="radio"/> 1	154
Is Application Code	<input checked="" type="radio"/> 0 <input type="radio"/> 1	156
Is Stream Module	<input checked="" type="radio"/> 0 <input type="radio"/> 1	158
DMS Compliant	<input checked="" type="radio"/> 0 <input type="radio"/> 1	160
Reserved Flag 1	<input checked="" type="radio"/> 0 <input type="radio"/> 1	162
Reserved Flag 2	<input checked="" type="radio"/> 0 <input type="radio"/> 1	164
Reserved 1	0	166
Reserved 2	0	168

128

FIG. 13

**FIG. 14A****FIG. 14B****FIG. 14C****FIG. 14D**

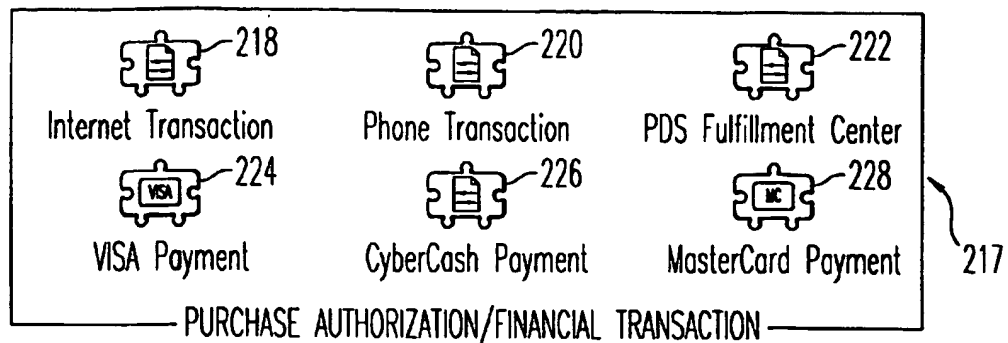


FIG. 14E

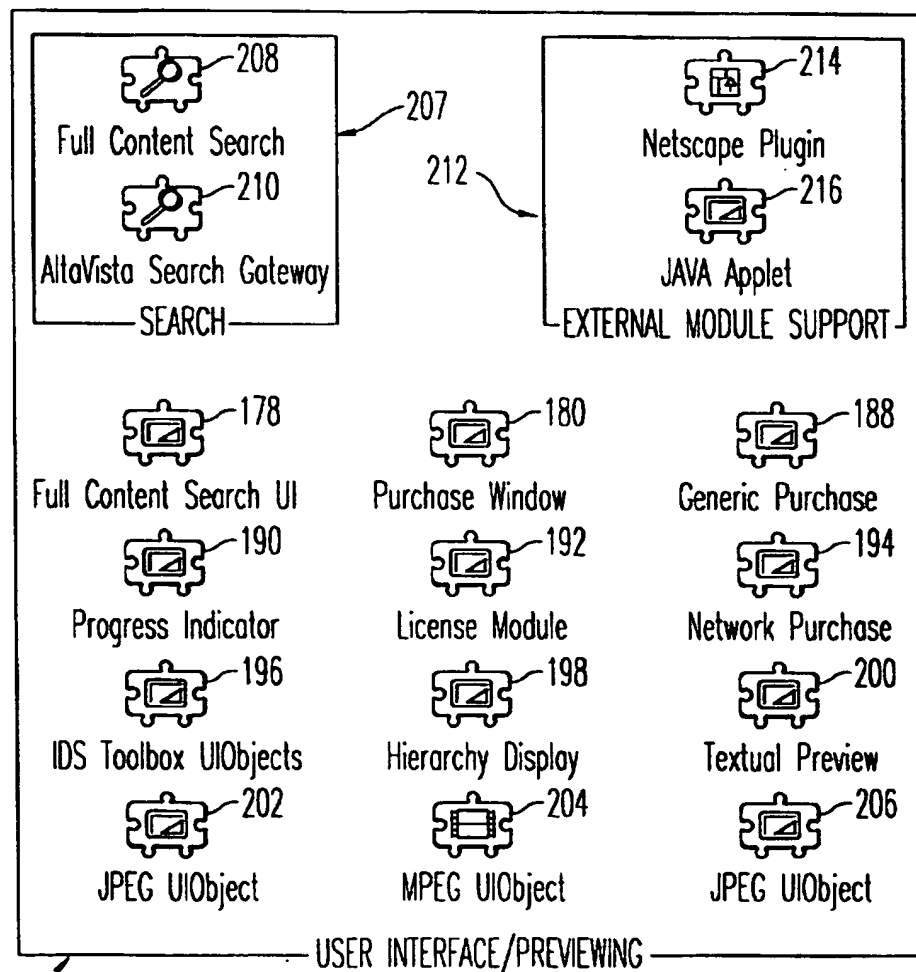


FIG. 14F

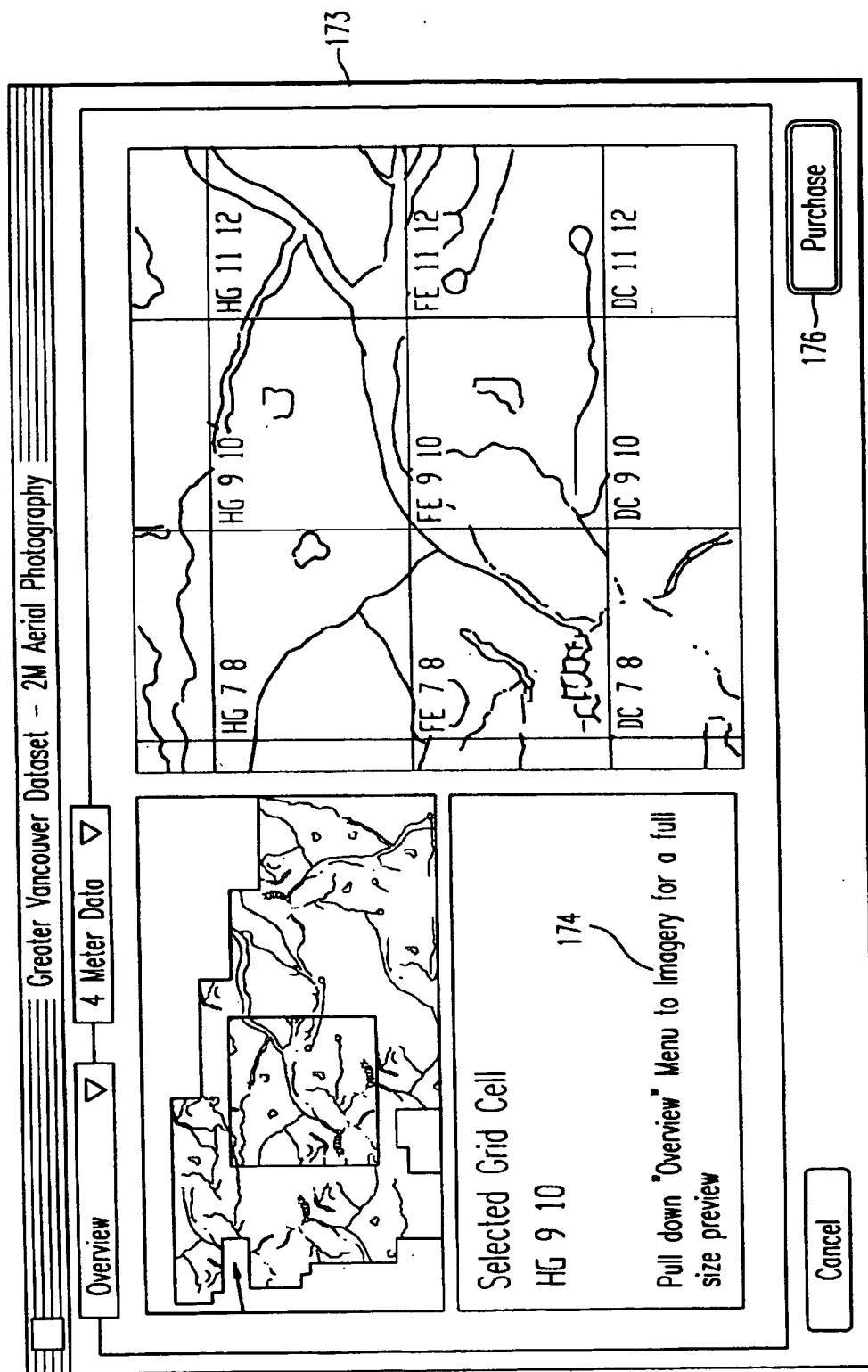
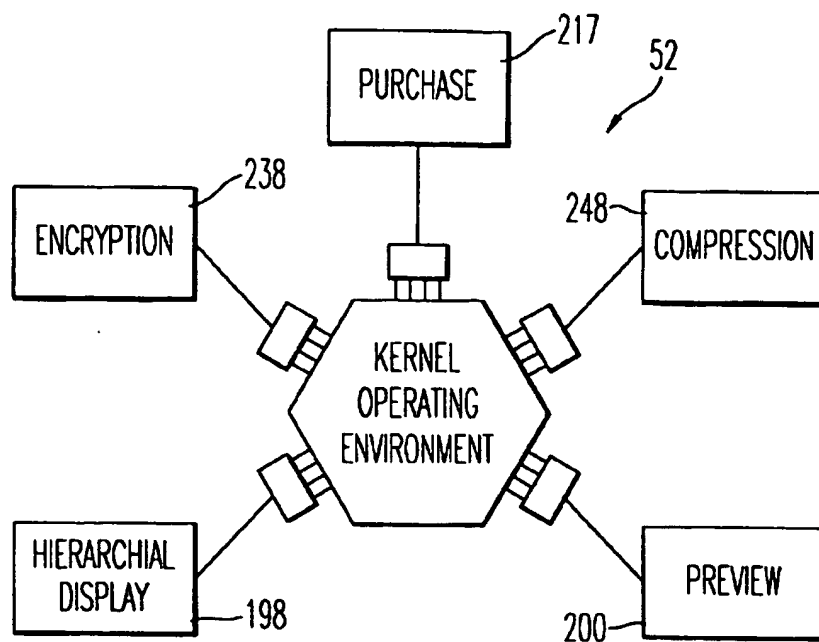
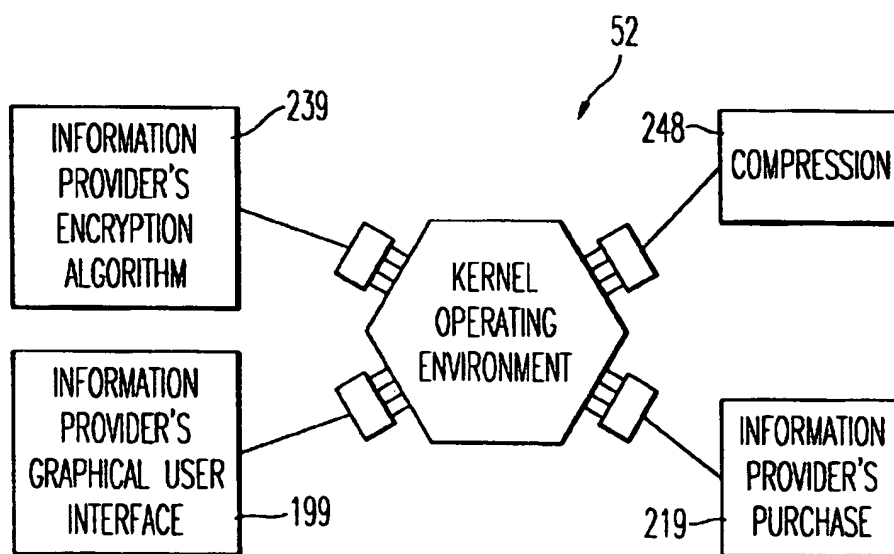
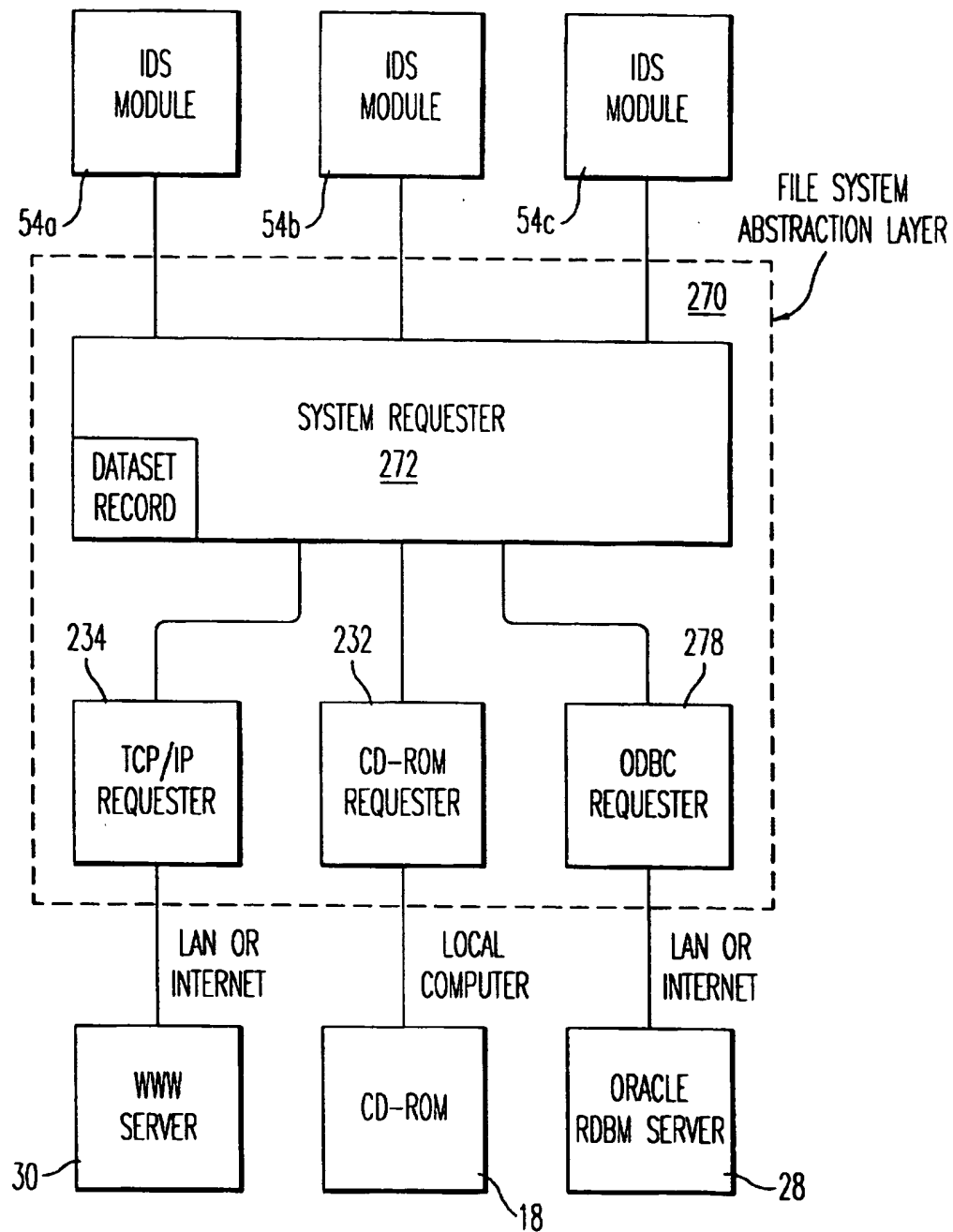
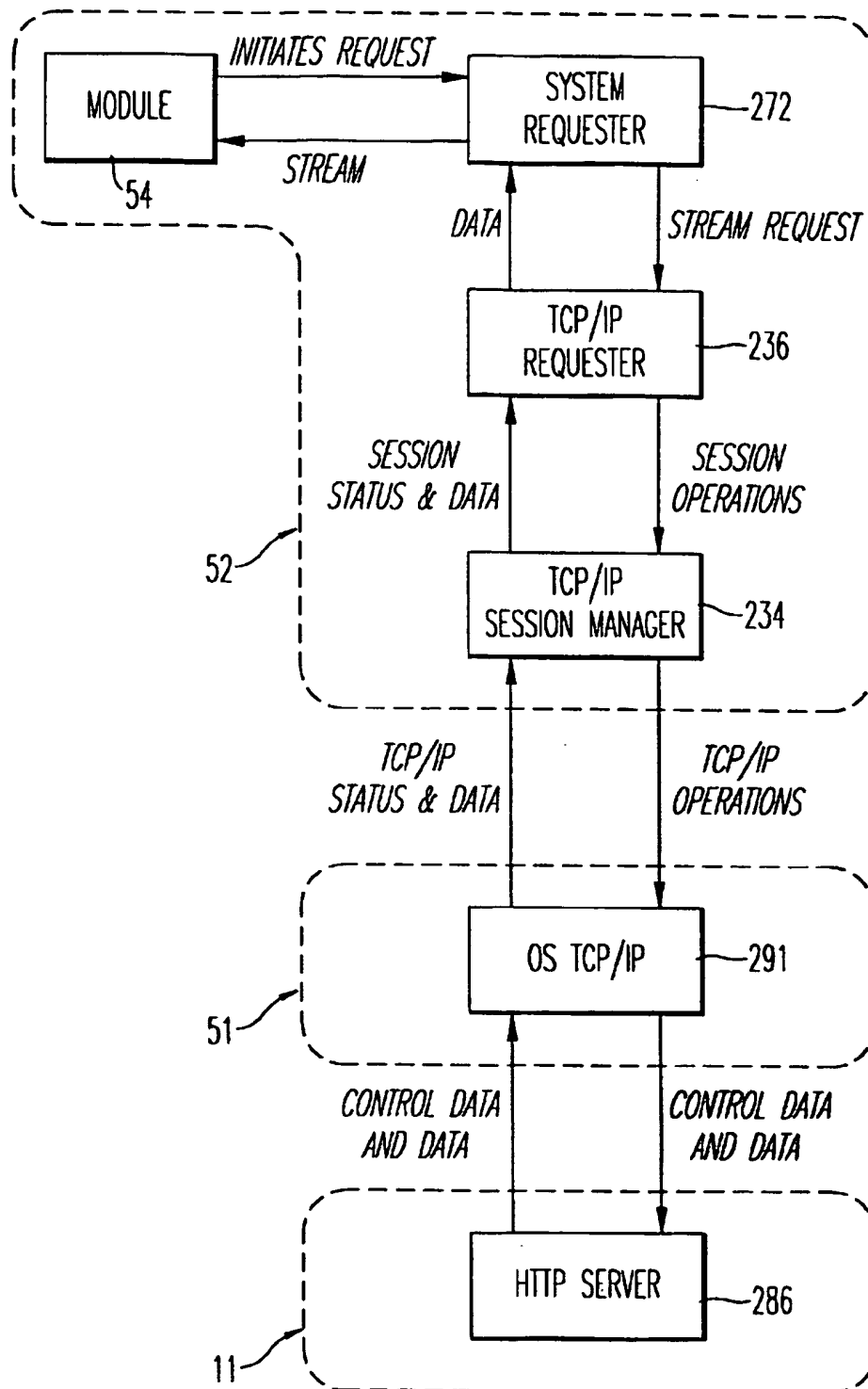


FIG. 15

*FIG. 17**FIG. 18*

**FIG. 19**

**FIG. 20**

ID (SORT KEY) (64 BITS)	TYPE (2 BITS)	NAME (4080 BITS)	ATTRIBUTES (128 BITS)	DATA (VARIABLE)
0	ROOT	SAMPLE DATASET	ATTRIBUTE TABLE	ROOT IDENTIFIER
0:1	SEGMENT	PERMISSIONS TABLE	ATTRIBUTE TABLE	PERMISSION TABLE
0:2	SEGMENT	SAMPLE IMAGE	ATTRIBUTE TABLE	IMAGE DATA
1	GROUP	TEST	ATTRIBUTE TABLE	PARENT ID (0)
1:1	SEGMENT	PERMISSIONS TABLE	ATTRIBUTE TABLE	PERMISSION TABLE
2	ITEM	SAMPLE ITEM	ATTRIBUTE TABLE	PARENT ID (1)
2:1	SEGMENT	PERMISSIONS TABLE	ATTRIBUTE TABLE	PERMISSION TABLE
2:2	SEGMENT	PURCHASABLE ITEM	ATTRIBUTE TABLE	EXECUTABLE FILE

FIG. 21

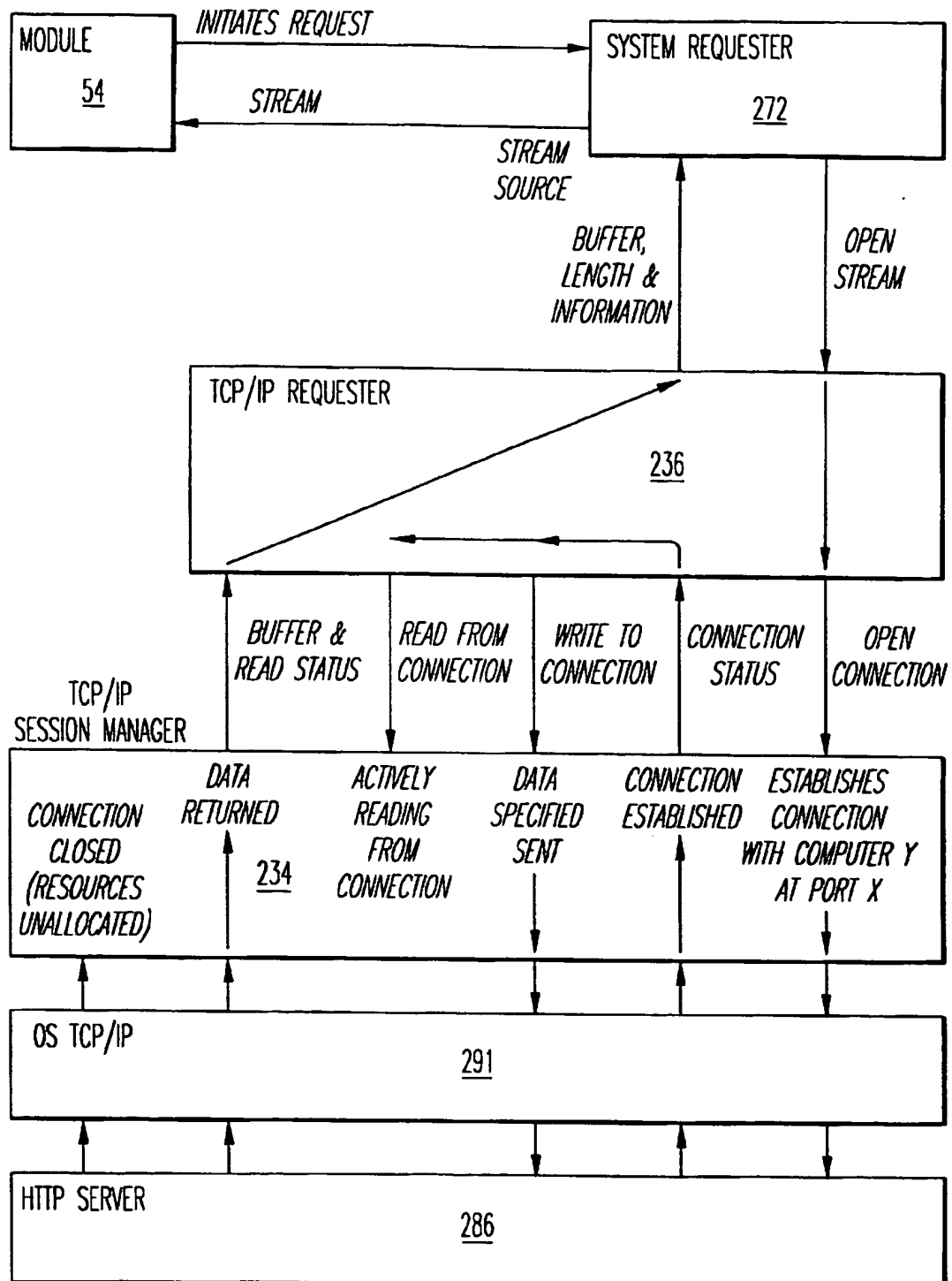
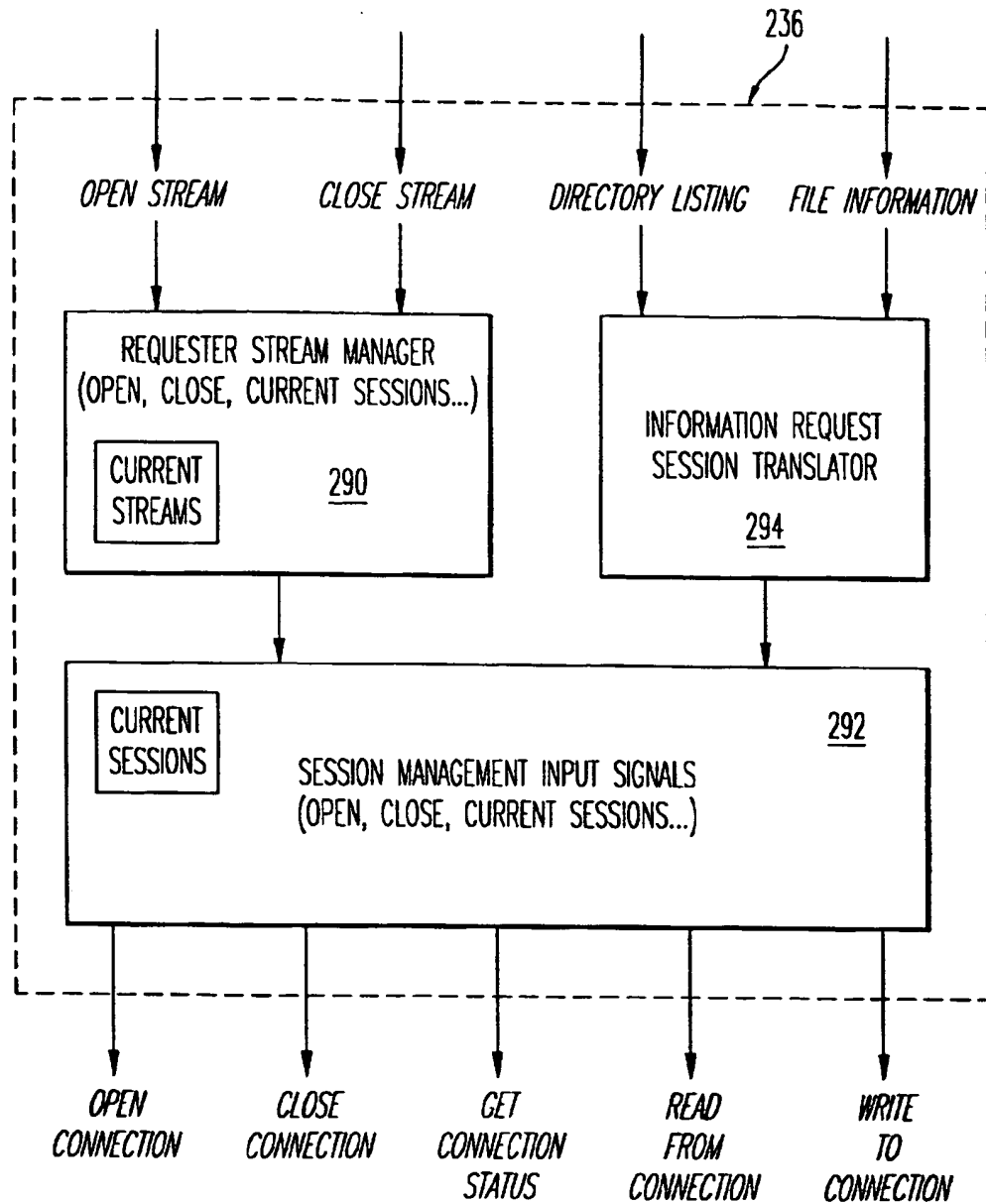
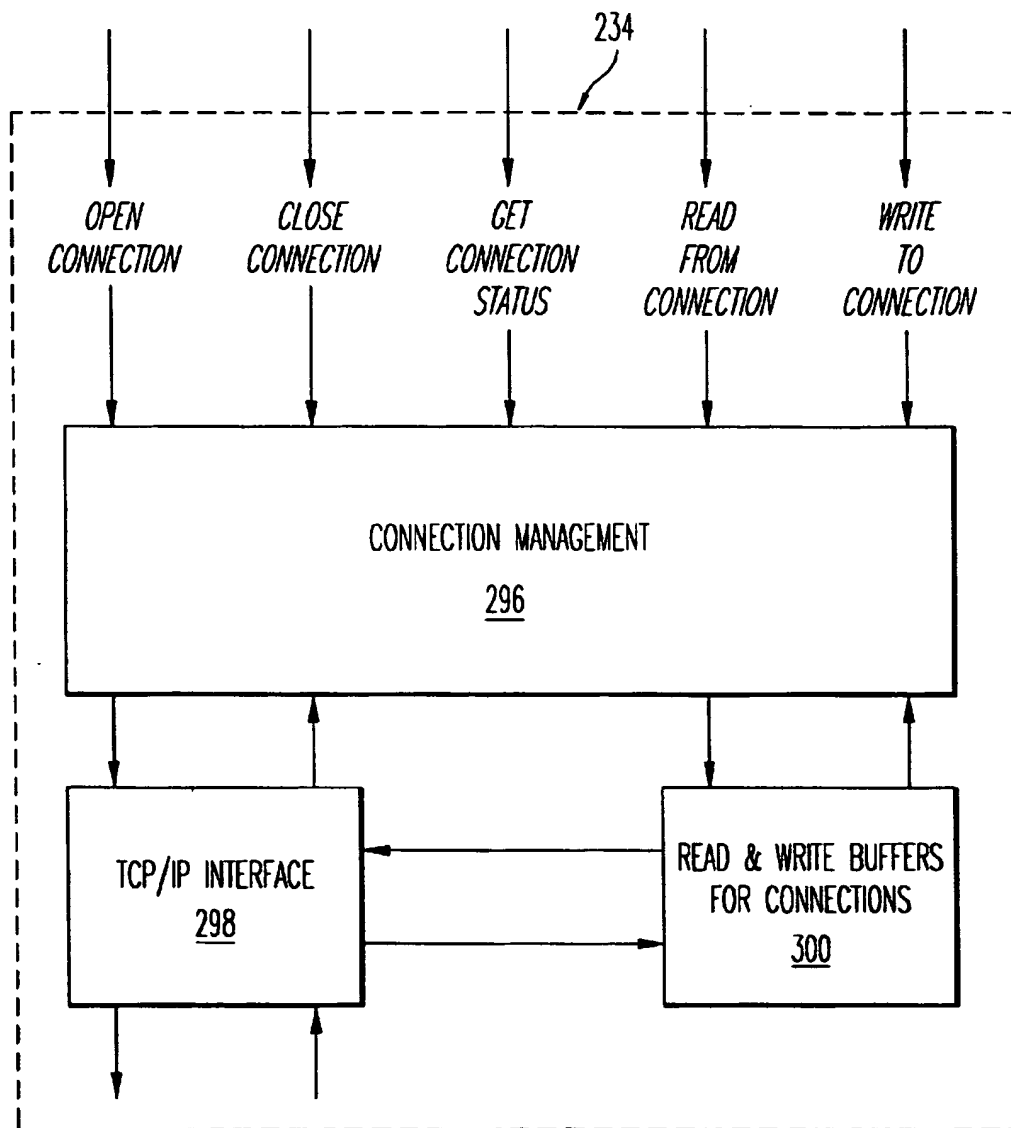
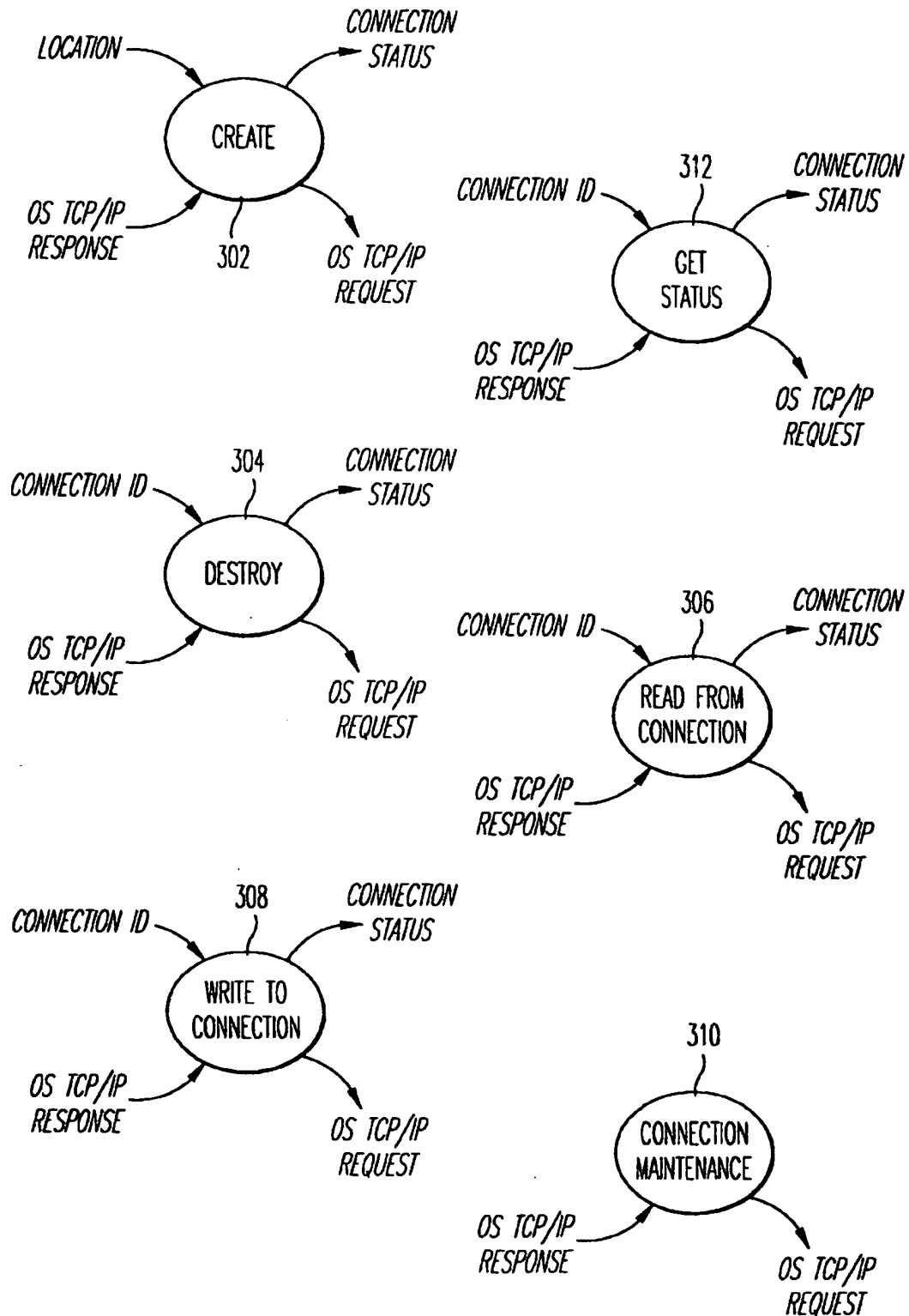


FIG. 22

**FIG. 23**

**FIG. 24**

**FIG. 25**

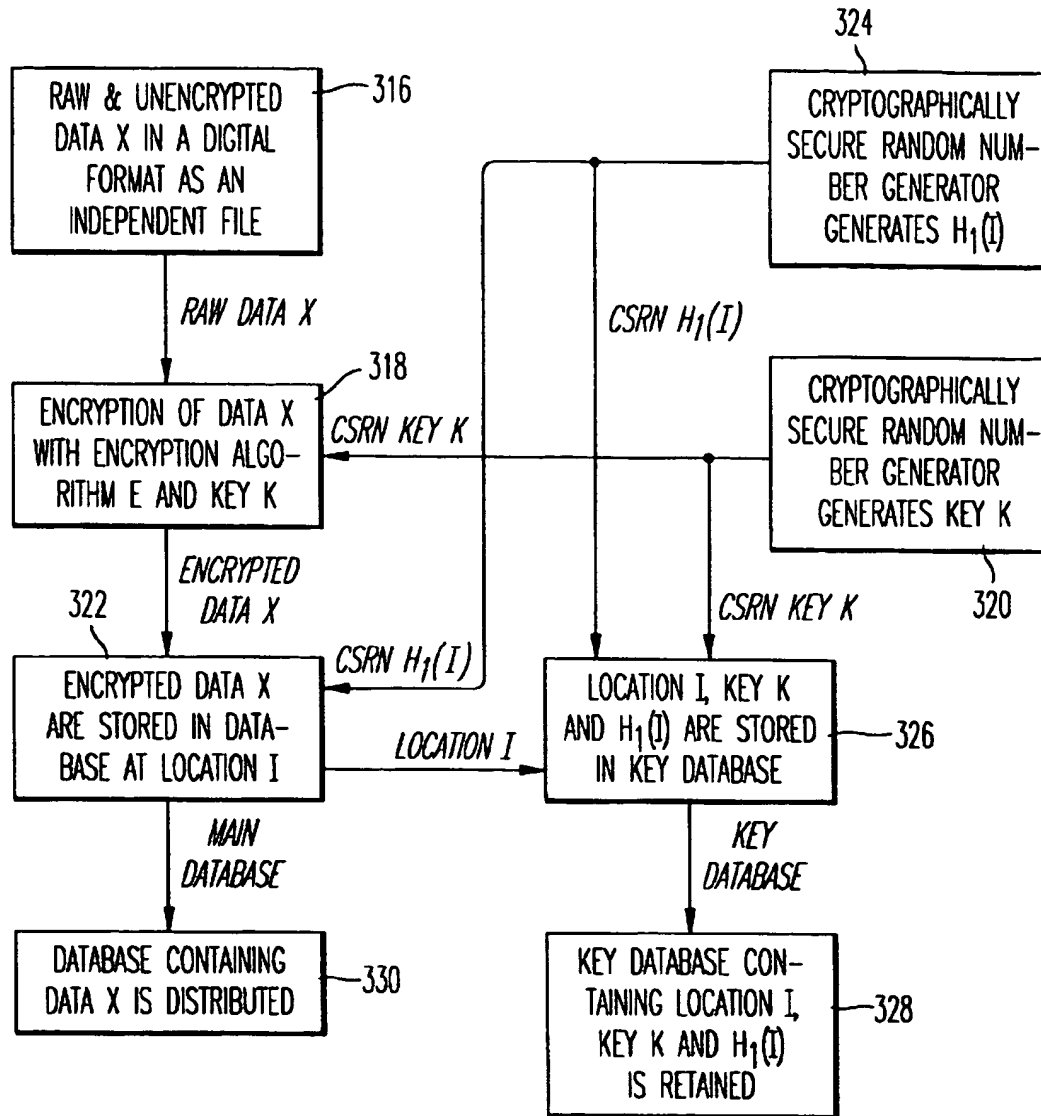
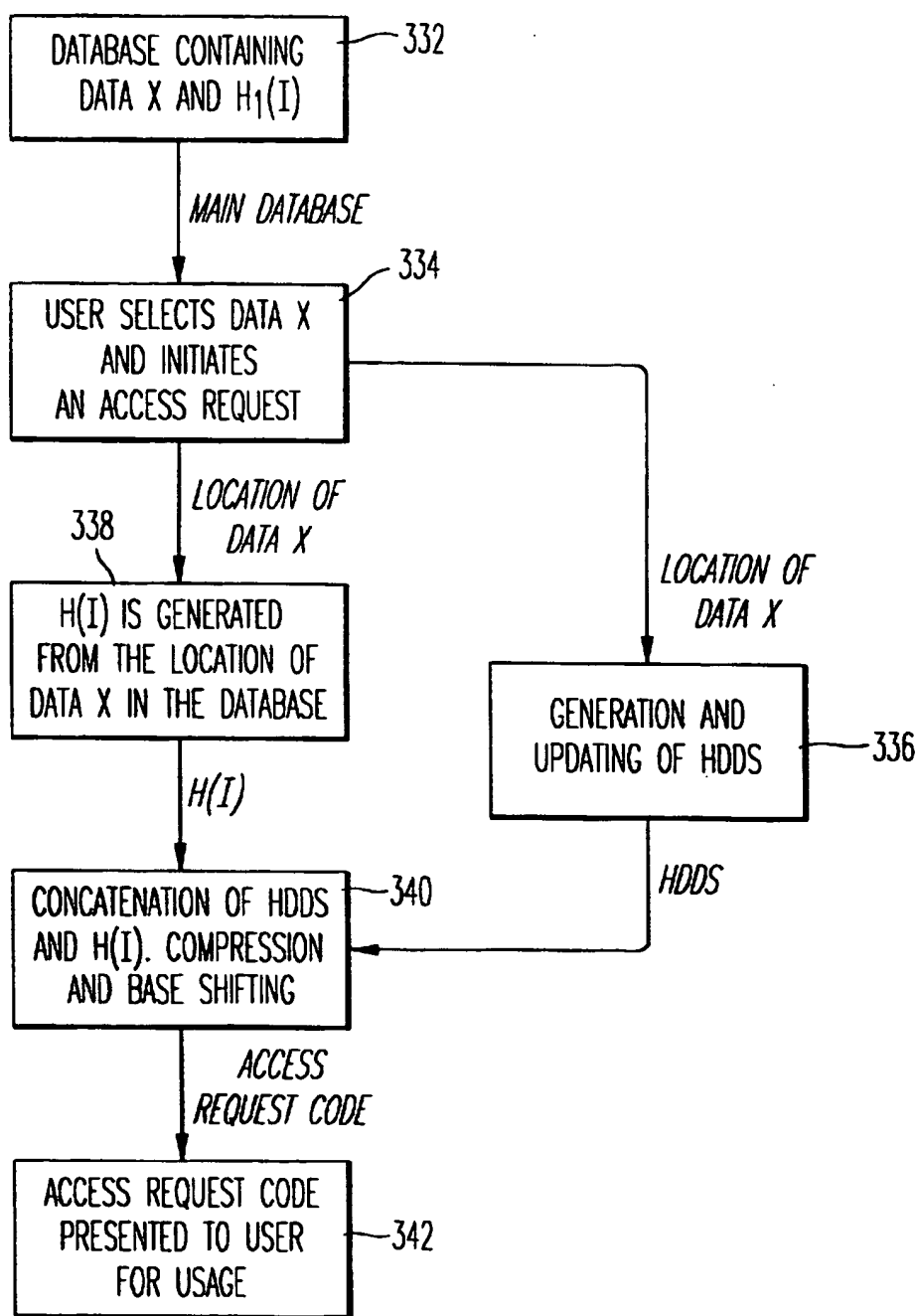


FIG. 26

**FIG. 27**

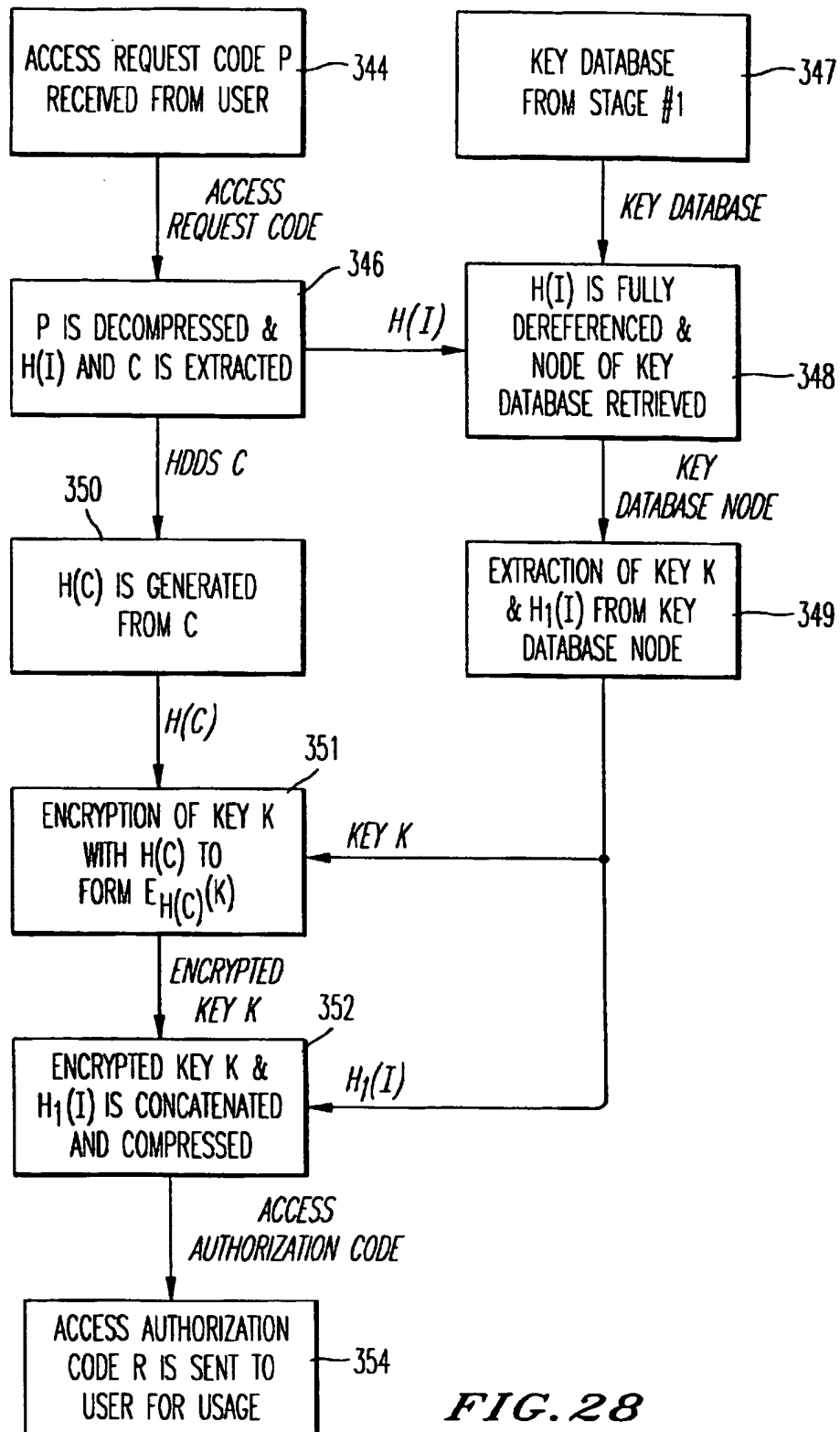


FIG. 28

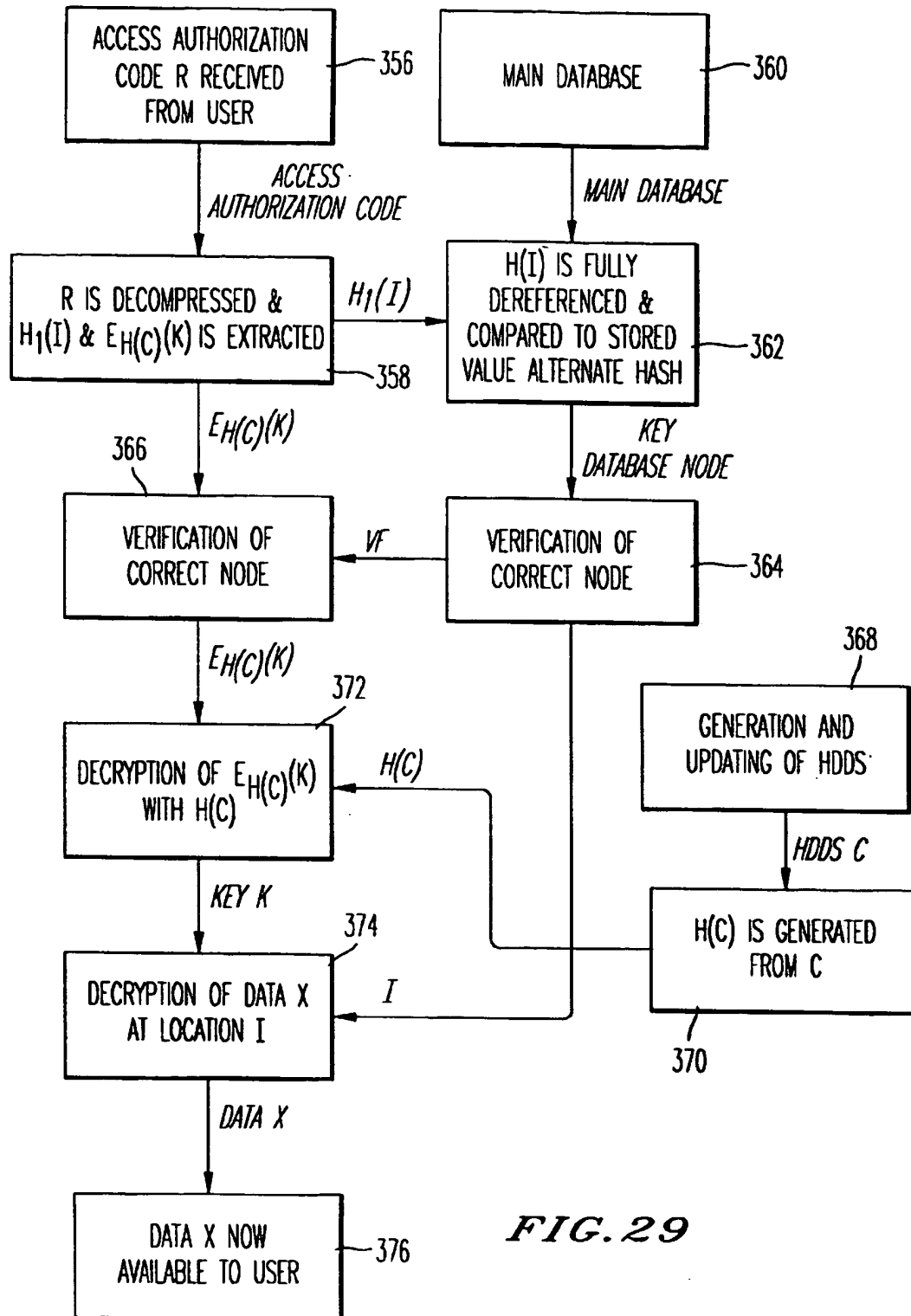


FIG. 29

SYSTEM FOR DISTRIBUTING DIGITAL INFORMATION

FIELD OF THE INVENTION

The invention relates to a system for distributing digital data and an authorization method preventing access to secured datasets by anyone other than an authorized end-user.

BACKGROUND OF THE INVENTION

The demand for methods of economically distributing digital data among a plurality of consumers is increasing, along with the demand for software publishing and distribution and the transmission of large datasets such as digital, aeronautical and satellite images. Retail software is typically sold in shrink-wrapped boxes containing manuals and a number of magnetic or optical diskettes for installing the software on a computer. Frequently, only one software title or a small group of related software is sold in each box. This method of distributing software is problematic because of limited shelf space available in retail stores. Further, while retailers attempt to maximize revenue from the sale of software displayed on limited shelf space, they are frequently required to discount retail prices in order to prosper in a competitive software retail market. Consequently, profit margins for software sales can be relatively small, although the computer software industry is growing. In a consumer market where large software publishers are earning marginal profit for distributed software programs, many small software publishers (i.e., publishers which market only a single or a few software program titles that are focused on a narrow market segment or have limited mass appeal) are not competitive for retailer shelf space. A need exists for an improved distribution system which accommodates both large and small software publishers.

The advent of compact disc read-only memory (CD-ROM) technology, which has comparatively large storage potential, permits many software program titles to be contained on one compact disc (CD). Thus, the number of unique products and the packaging for distributing software titles is reduced. Further, the distribution of titles on CD-ROM technology allows users to preview software before purchasing it, an advantage not realized by shrink-wrapped box packaging. In the past, consumers were limited to the graphics and text information on the shrink-wrapped box when deciding on whether or not to purchase software. CD-ROM technology allows information providers to provide preview datasets or limited-use datasets on the CD-ROM, as well as the individual software titles and the actual software for sale.

In addition to CD-ROM technology, the Internet offers a economical opportunity for both large and small software publishers to distribute software to end users. The Internet is a worldwide network of computer terminals that communicate with each other using a standard protocol known as Transmission Control Protocol/Internet Protocol (TCP/IP). Internet use has been simplified and promoted by the advent of the World Wide Web ("the web" or "WWW") and Internet navigation tools such as Netscape™ and Mosaic™. The web is a worldwide network of sites where easy-to-use, multimedia information is made available to Internet users. Typically, Internet subscribers may have information that they wish to share with other interested users of the Internet. A subscriber designs a home page or a web site comprising a catalog of information that is to be made available to interested users. The home page is provided with an address

on the web. By using a web navigation tool such as Netscape, users anywhere on the Internet can enter the address of the web site to access the catalog. The navigational software then locates the net site specified by the address, bringing the catalog of information to the user's computer screen.

The home pages and web navigational tools allow consumers to browse and purchase selected software titles over the Internet, among other datasets. The brief title descriptions and, in some cases, limited-use versions of software allow consumers to make better software purchase decisions on-line, eliminating a time consuming and often unproductive visit to a software retailer. In addition, software publishers benefit from the Internet because the cost of manufacturing and distributing information regarding software over the Internet is relatively low when compared with manufacturing, packaging and purchasing retail space. Consequently, the profit margin from software distribution via the Internet is increased in comparison with that of current retail distribution systems for software.

In addition to software distribution, government entities and businesses owning datasets, such as digital, aeronautical and satellite images of the surface of the earth are also looking for a better system for distributing their products. Potential consumers for these data products include municipal planning and service departments, public utility companies, real estate developers, engineers, architects and market location specialists.

Government research facilities have been collecting satellite and aeronautical images of the earth for a number of years to create orthoimages and topographical maps, to characterize physical geography, and to manage forests (e.g., track forest fires), among other applications. Selling the earth imaging data has been considered recently to generate revenue; however, the infrastructure with which to market the data has been lacking in the past. Datasets such as those of the Geographic Information Services (GIS) are typically very large, i.e., on the order of terabytes. These large datasets can now be transmitted economically using CD-ROM or Internet technology. Imagery and other topographical data can be merged with spatial data such as census results, for example, and become a powerful tool for a wider range of applications, such as the creation of demographic data superimposed upon a map for use by consumer marketing companies.

A number of systems have been developed for delivering digital information using CD-ROM technology. These systems do not propose an Internet solution and are not modular. Upgrades to the system, therefore, require development of a significant amount of program code.

A number of on-line data publishing and purchasing systems have also been developed. One system allows businesses with a large volume of commercial data to build their own databases and to add functions and otherwise create browsers for the web to search for specific datasets in the databases. If the desired information is found, the data is electronically wrapped with a cryptographic algorithm which prevents a user from accessing the data until credit is established. This system is disadvantageous because the searching and encryption methods used are expensive to implement. Further, it is configured for use on the Internet only, and does not work on large files that are appropriate for distribution on CD-ROM.

Another system allows information providers to distribute secure information over the Internet via a secure Netscape commerce server. This system is disadvantageous because

information providers cannot encrypt individual datasets. Further, a separate server must be purchased from Netscape, and the data to be distributed into datasets reorganized and then moved onto the server. This system is similarly not available for use with CD-ROM. The security feature provided by the Netscape server is not extended to a server for a CD-ROM.

Another on-line purchasing system allows products to be encrypted individually on a server. This system allows information providers to download, encrypt and publish data on the Internet via the server. Internet users are provided with a security access key for a fee. This system, however, is characterized by poor encryption and security implementation, as well as poor previewing capabilities.

Another system allows users to browse and purchase stock photographs on-line using a Netscape server. This system comprises an Oracle database, a custom common gateway interface to access, preview and store the data, and a CyberCash device for credit card transactions, among other hardware. This system, however, is expensive and is relatively slow when downloading data.

A need exists for a data distribution system which is capable of downloading digital data to users from different devices (e.g., CD-ROM, the Internet or other networks such as a satellite communications network) in a manner that maintains the location of the data transparently with respect to most system software components. Since the options for storing and transporting secured data are increasing, a need exists for a data distribution system which can locate datasets anywhere within an information provider's network.

A need also exists for a data distribution system which allows persistent encryption of individual datasets, that is, data that remains encrypted even if it is copied around by an authorized user. In contrast, unauthorized users can copy around a Netscape server to obtain data that is no longer secured. Further, a need exists for a data distribution system that allows information providers to organize datasets for different applications using different levels of security, yet ship the entire catalog of datasets on a single CD-ROM, for example. Datasets that are secured independently of a server, therefore, are not at risk when the server is compromised.

Since a number of business issues relating to Internet commerce have yet to be resolved, a majority of information providers have selected CD-ROM technology as their medium of choice for distributing data. A need exists, however, for a data distribution system that offers a seamless transition from CD-ROM-based data distribution to data distribution on the Internet.

In addition, a need exists for a data distribution system which has a modular architecture and is flexible, allowing providers to purchase a base system at reasonable cost and as many software modules as needed to build a custom data distribution system to suit their needs. For example, an information provider may wish to use a different encryption technology without having to redevelop other system software modules. Further, a modular architecture can be upgraded, modified, or operated on a different operating system with minimal software development.

Finally, a need exists for a method of authorizing access to encrypted data which prevents the unlocking of datasets on unauthorized computers or by unauthorized users. This is particularly important as public terminals become available from which users can access and purchase secured data.

SUMMARY OF THE INVENTION

In accordance with an aspect of the present invention, a system for distributing digital data among a plurality of

customers is provided which has a modular software architecture. The system software comprises a kernel having a kernel operating system interface for communicating with the host operating system on the customer computer, and a plurality of kernel modules for managing search, encryption, compression, purchasing transactions and other functions. The kernel modules communicate with each other and with the host operating system via events posted to and retrieved from a kernel event queue. A dispatcher module is provided which retrieves events from the kernel event queue and routes them to the appropriate kernel modules.

In accordance with another aspect of the present invention, the kernel is programmed to dynamically load and unload selected ones of the plurality of kernel modules depending on the events retrieved from the kernel event queue.

In accordance with yet another aspect of the present invention, the kernel comprises at least one requester module for maintaining the storage location of the datasets transparently with respect to the plurality of kernel modules. The datasets can be stored in a plurality of different storage locations, such as a network server, a database server, a web site server, a portable storage device, as well as on the hard drive of the customer computer.

In accordance with still yet another aspect of the present invention, the plurality of kernel modules are platform-dependent, while the rest of the kernel software is platform-independent. Different sets of kernel modules can be programmed using application programming interface functions of different operating systems.

In accordance with still yet another aspect of the present invention, product codes sent by the customer to purchase a selected dataset, and release codes for decrypting the selected dataset, are generated in a manner which renders them computer-dependent to protect against unauthorized use of the selected dataset.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects and advantages of the present invention will be more readily apprehended from the following detailed description when read in connection with the appended drawings, which form a part of this original disclosure, and wherein:

FIG. 1 is a schematic block diagram of a data distribution system (DDS) constructed in accordance with an embodiment of the present invention;

FIGS. 2 and 3 are schematic block diagrams illustrating DDS components constructed in accordance with an embodiment of the present invention for requesting encrypted data stored on a local portable storage device and receiving an access or release code to unlock that data;

FIGS. 4 and 5 are schematic block diagrams illustrating DDS components constructed in accordance with an embodiment of the present invention for purchasing data stored on a server located remotely with respect to the customer computer;

FIG. 6 is a screen that can be generated on an information provider's computer or at a fulfillment center in accordance with an embodiment of the present invention to guide an operator when creating an encrypted dataset;

FIG. 7 is a screen that can be generated on a customer computer for in accordance with an embodiment of the present invention for guiding the customer when selecting a dataset;

FIG. 8 is a schematic block diagram of a kernel constructed in accordance with an embodiment of the present invention for operating the DDS;

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FIG. 9 is a flow chart illustrating the sequence of operations for initializing a kernel in accordance with an embodiment of the present invention;

FIG. 10 is a flow chart illustrating the sequence of operations for processing events in a kernel constructed in accordance with an embodiment of the present invention;

FIG. 11 is a diagram illustrating a kernel thread and a module thread in accordance with an embodiment of the present invention;

FIG. 12 is a flow chart illustrating the sequence of operations for loading and unloading kernel modules and processing events in accordance with an embodiment of the present invention;

FIG. 13 is a computer screen illustrating the fields in a record created for each kernel module in accordance with an embodiment of the present invention;

FIG. 14 is a screen that can be generated on an information provider computer or fulfillment center computer illustrating a number of kernel modules that are available for use in a kernel in accordance with an embodiment of the present invention;

FIG. 15 is a screen which can be generated on a customer computer for guiding a customer when previewing and selecting a dataset in accordance with an embodiment of the present invention;

FIG. 16 is a screen that can be generated on a customer computer for guiding a customer when purchasing a selected dataset in accordance with an embodiment of the present invention;

FIGS. 17 and 18 are schematic block diagrams, respectively, of basic and customized DDS modular architectures in accordance with an embodiment of the present invention;

FIG. 19 is a schematic block diagram illustrating an abstraction layer in a kernel programmed in accordance with an embodiment of the present invention;

FIG. 20 is a schematic block diagram illustrating data flow between a customer computer and a remote dataset storage location accessed via a communication network in accordance with an embodiment of the present invention;

FIG. 21 illustrates a portion of a location database table in accordance with an embodiment of the present invention;

FIGS. 22, 23 and 24 are flow charts illustrating data flow between the components illustrated in FIG. 20;

FIG. 25 illustrates high-level events processed by a TCP/IP session manager programmed in accordance with an embodiment of the present invention; and

FIGS. 26, 27, 28 and 29 are flow charts illustrating the sequence of operations for generating release code requests and release codes in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The data distribution system (DDS) 10 of the present invention allows customers or end-users to browse or search through data available from a number of information providers and to purchase selected data directly via their respective computers. FIG. 1 illustrates exemplary hardware components for implementing the DDS 10. Three customer computers 12a, 12b and 12c, which are hereinafter collectively referred to a customer computers 12, are shown in FIG. 1 for illustrative purposes. The computers 12 are preferably conventional personal computers or workstations

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which comprise a monitor 13, an optional hard drive 15 or other local memory device, a central processing unit 17 and a data input device 19 such as a keyboard or a mouse. The computers 12 can operate using one of a number of operating systems (OSs) developed for IBM-compatible or Macintosh computers or the UNIX operating system, for example. The computers 12 can also be workstations having no local memory device.

With reference to FIG. 1, information providers 11 such as government research facilities with earth imaging data and software publishers can provide raw data such as digitized maps and program code, respectively, to a fulfillment center 14. The fulfillment center 14 comprises dataset assembly modules 16 which arrange and organize the raw data into datasets. It is to be understood that substantially any type of information that can be digitized can be assembled as a dataset for viewing and purchasing via the DDS 10, and that datasets are not limited to maps and software. The datasets can be verified by the information providers 11, encrypted and stored, for example, on a master copy of a portable data storage device 18 such as a compact disc read-only memory (CD-ROM). The master CD-ROM 18 is then mass-produced and distributed to the customers. Datasets from more than one information provider 11 can be stored on a single CD-ROM 18. Further, other types of portable data storage devices 18 can be provided with datasets and distributed such as digital audio tapes and magnetic diskettes.

Customers can access selected datasets from one or more CD-ROMs 18 via a CD-ROM drive 20 at their computers 12. Alternatively, the CD-ROM(s) 18 can be read from a CD-ROM drive 20 at the fulfillment center 14 that is accessed via a communication network 22 and a server 24. Thus, a customer computer 12c that is not connected to a CD-ROM drive 20 can have on-line access to the datasets at the fulfillment center 14 via a modem 26 or other network interface device. The network 22, for example, can be a public switched telephone network, an optical fiber network, a satellite network, a microwave or cellular communication system or a combination of different types of communication networks.

With continued reference to FIG. 1, the datasets can be stored on a relational database server 28, on a WWW server 30 at a web site, on an Internet 32 installed at a corporate or university campus, and other shared memory devices, as well as on portable memory devices 18 at the customer computer 12 and at the fulfillment center 14. The flow of data between a customer and an information source such as a fulfillment center 14, a local CD-ROM at the customer premises or a remote third party provider is illustrated in FIGS. 2-5. FIGS. 2 and 3 illustrate distribution of datasets from a CD-ROM 18 to the customer computer 12a or 12b. FIGS. 4 and 5 illustrate distribution of datasets from a remote location to the computer 12b or 12c.

As will be described in more detail below, the customers can browse and search datasets, and then purchase selected datasets for downloading directly to the hard drives 15 of their computer 12. With reference to FIG. 2, the computer 12 is programmed to process a request for a dataset from an end-user 29 by locating the data on the CD-ROM 18. Dataset purchases are made by contacting the fulfillment center 14 via a telephone using a 1-800 telephone number, for example, or via facsimile to obtain an access or release code from an operator which releases or unlocks the requested dataset, as shown in FIG. 3. Upon connection, the customer preferably speaks a product code for the dataset he or she wishes to purchase to an operator 21, sends a

facsimile message, or enters the code on a telephone keypad or via the user interface device 19. The customer 29 can also give the operator 21 his or her name. If the customer is already in a customer database maintained at the fulfillment center 14, a transaction to purchase the data follows; otherwise, customer information is first entered by the operator. The product code is entered into an order terminal 27 and processed by a transaction server 23 to generate a release code. Once a payment method is agreed upon (i.e., credit or bank account debit cards) and the financial transaction authorized (e.g., by a credit card authorization service 25), the operator 21 either verbally provides the release code over the telephone to the customer 29 or transmits the number via DTMF tones or facsimile to the customer computer 12 to complete the transaction. The dataset can then be decrypted using the release code.

If the computer is configured to access the network 22 (e.g., computers 12b and 12c), a request from a user 29 for a particular dataset is processed by the kernel 52, as described in further detail below, to initiate a connection via the operating system 51 of the computer 12 to a remote information server 34. The server 34 can be operated by a third party, as shown in FIG. 4, or by the fulfillment center (e.g., server 24 in FIG. 1). The server 34 or 24 provides the requested dataset to the computer 12. Regardless of where the information server is located, a connection is made to the fulfillment center 14 via a gateway server 36 to transmit an encrypted access or release code request for the desired dataset, as shown in FIG. 5. The transaction server 23 in turn provides the computer 12b or 12c with an access or release code via the gateway server 36 and the network 22 after a payment method is established. The access code is processed at the computer 12 to decrypt the dataset.

As will be described in further detail below, the DDS 10 can generate user-dependent product codes (i.e., the codes only work on the purchaser's computer to prevent distribution of the release code or a posting of it on the Internet) and access or release codes to verify that the customer is permitted to have access to the requested data; however, other types of authorization codes can be used. For example, release codes can be generated which are useful for only a predetermined period of time. The length of the release and product codes is dependent on the level of security desired by the information provider 11 for individual datasets. A number of encryption algorithms can be used to encrypt the datasets, and more than one algorithm can be used on the datasets simultaneously. The DES (Data Encryption Standard) algorithm and the RSA RC4 algorithm, however, are preferably used.

As shown in FIGS. 3 and 5 the fulfillment center 14 manages financial transactions and maintains demographic information about the customers. After a purchase of information is made, a payment for the purchase of a dataset is relayed to the information provider 11, thereby allowing financial transactions to be fully audited and the purchases and flow of funds traced. Alternatively, a third party can be employed to manage customer accounts and transactions and payments to the information providers 11. The demographic information maintained by the fulfillment center 14 can comprise, for example, customer purchase history and product purchase information and can be used by information providers 11 for marketing purposes. The fulfillment center 14 can generate invoices upon customer request which can be sent to the customer via facsimile or mail, or sent directly by modem to the information provider for processing.

Each dataset is preferably characterized by four records, that is, the type of data which constitutes the dataset, the

price for purchasing the dataset, the dataset name and a brief description of the dataset for search purposes, respectively. The dataset records are maintained in a location database on the CD-ROM 18, or other memory device at the fulfillment center 14. FIG. 6 illustrates a screen 38 generated by the dataset assembly module 16 for guiding an operator when creating datasets from raw data. Additional information for describing the dataset can be entered into these records. For example, the length and sampling rate of a data set comprising a segment of digital audio can be entered, along with other sound-specific information. An information provider can offer customers a number of features to speed the entry of information when selecting a dataset, such as presetting fields that are displayed on a dataset order screen generated on the display device or monitor 13 of the customer computer 12, or grouping similar data types.

In the data assembly modules 16, the hierarchy of the purchasable data, as well as groups or collections of purchasable data, are organized and provided with icons, titles and group titles as desired by the information provider 11. Previews are subsequently added to the data. Information providers can opt to provide previews and brief descriptions of the datasets, along with the actual data that is to be sold, on the CD-ROM 18 or information server 34. Customers can therefore sample and preview datasets before deciding to purchase them. The previews are typically screens generated on the monitor 15 of the customer computer 12 which reveal a part of a digitized map or a limited-use version of a software program, for example, as well as instructions for purchasing the dataset. With reference to the preview screen 40 depicted in FIG. 7, the screen associates different maps datasets to a group of datasets. Each cell 48 in the grid 50 corresponds to a dataset which has a title. The entire grid 50 has a group title. After the previews and descriptive information have been organized and verified by the information provider 11, the data are encrypted and linked to the purchasable data in the datasets and stored on a CD-ROM 18, for example. Their storage locations are stored in the location database.

The software architecture of the DDS 10 will now be described with reference to FIG. 8. The software architecture comprises a kernel 52 having a number of DDS software modules 54a, 54b, and 54c, which are collectively referred to as DDS modules 54. The kernel 52 maintains an operating environment in which these DDS modules 54 function, and runs on top of the host operating system 51 of the customer computer 12. The kernel 52 also comprises a number of functional components which are described below to create a modular, multitasking, cross-platform, multimedia data distribution system.

The kernel 52 is the foundation for a modular software architecture. The kernel 52 is designed to take up a minimal amount of disk space and operating memory. Portions of the software architecture are dynamically loaded and unloaded on to the hard drive 15 of the computer 12 as needed, and can be developed, tested and re-used separately from the rest of the program code. The kernel 52 is preferably platform-independent and can run off a number of different host operating systems 51. For example, the kernel can be operated with the MacOS 7.x operating system for the PowerPC architecture and the Motorola 680x0 architecture, as well as the UNIX operating system, the WINDOWS NT, WINDOWS 95, WINDOWS 3.x and WINOS2 operating systems for the 80x86 architecture and MacOS2 and WINOS2 for the PowerPC architecture. It is preferably written using C++ and assembly programming languages. The DDS modules 54 are ported by rewording platform-dependent and operating system-dependent code.

The DDS modules 54 are preferably blocks of executable code and data that are preferably written in standard programming languages and development environments using the host operating system's application programming interface (API) functions. Thus, several sets of DDS modules 54 can be created for respective platforms in which the kernel 52 is used, such as the Macintosh Power PC or 680X0 architectures. The DDS modules 54 are preferably fully compiled and run as binary executables at the same speed as the native software of the customer computer 12. The DDS modules 54 communicate with the operating system 51 of the customer computer 12, the kernel 52 and with each other through events, kernel API services and operating system API services. The handling and posting of events represents a large portion of DDS module 54 functions. The DDS modules 54 post events to perform shared functions and to communicate with the kernel. The DDS modules 54 generate function calls to communicate with the operating system and other external services, respectively. There are preferably three main threads in the kernel 52, that is, a dispatcher thread, a base kernel thread and a common thread for the modules 54, and specific threads for the modules 54.

With continued reference to FIG. 8, the kernel 52 comprises a kernel operating system interface (KOSI) 56 to establish a connection with the host operating system 51, and to manage event-based communications between the operating system 51 and the kernel 52 such as translating an operating system event or message into a kernel event which is then stored in a kernel event queue 58. These operating system events run as the base kernel thread of the kernel 52 to perform initialization and deinitialization of the kernel 52, and to invoke a kernel dispatcher 60. The kernel dispatcher 60 retrieves events from the kernel event queue 58, determines where the events are to be sent using internal tables developed upon start-up of the kernel, and then routes the events to respective module event queues 60 which correspond to the destination DDS modules 54. As stated previously, the dispatcher 60 preferably runs on its own thread. The kernel 52 also comprises a kernel loader 62 which operates in conjunction with the dispatcher 60 to dynamically load and unload module code and data to and from the hard drive 15 and the CD-ROM 18 as needed to save memory space, as well as to maintain multiple module instances.

As stated previously, the kernel 52 supports exported function calls which are used by the DDS modules 54 to perform specific functions that are not accessed by posting events. These functions are hereinafter referred to as kernel service routines and are categorized as user interface (UI) management routines for generating windows and menus on the display device 13, and module management routines (e.g., module registration at start-up and during module loading and unloading). The modules can also access external functions via function calls (hereinafter referred to as service libraries) to access, for example, a part framework or preemptive multitasking libraries.

Kernel 52 initialization and data flow will now be described with reference to FIGS. 9 and 10, respectively. Each customer computer 12 in the DDS 10 is provided with the kernel 52 either on the CD-ROM(s) 18 or by accessing the server 24. The kernel 52 is initialized by the operating system 51 (block 70 of FIG. 5) and sets up critical data structures and tables for kernel operation (block 72). After the operating system 51 and the kernel 52 are fully initialized, an event called EVENT_CREATE is posted in the kernel event queue 58. The dispatcher 60 retrieves the EVENT_CREATE event and loads one of the DDS mod-

ules 54 called a start-up module 54c, which is shown in FIG. 4 (block 74). The start-up module 54c searches for other available modules 54a and 54b and builds a system module table 66 and other related data structures. The start-up module 64 then begins to load selected ones of the modules 54, such as user interface and preview modules which are described below in connection with FIG. 14.

In a fully preemptive, thread-based operating system, the primary kernel 52 functions are preferably in a separate thread from the kernel loader 62. The dispatcher 60 continues to retrieve events from the kernel event queue 58, and the operating system 51 continues to post events in the kernel event queue 58, until the operating system 51 posts an EVENT_DESTROY event to the kernel event 58 queue which has the kernel 52 as its destination. The kernel 52 in turn processes all pending events and posts EVENT_DESTROY events to all active DDS modules 54 (block 76) before deinitializing itself (block 78).

An event loop is shown in the flow chart of FIG. 10. Following program control and initialization, an operating system event is retrieved from an operating system queue 62 which is shown in FIG. 4 by the KOSI 56 (block 80). Operating system events are translated into kernel events (blocks 82 and 84) before being resolved into an event for a specific DDS module 54 (block 86). The kernel 52 is otherwise programmed to retrieve an event from the kernel event queue 58 when no operating system events have been posted in the operating system event queue 62 (block 88).

If the event is not an EVENT_DESTROY event (blocks 90 and 92), the dispatcher 60 determines the destination of the event and posts it into a specific module queue 62 (blocks 86 and 94); otherwise, the program control of the kernel 52 is deinitialized as indicated by the affirmative branch of block 92. If there are no events in the kernel event queue 58, the kernel 52 is programmed to create an idle event and to select a particular destination module at which to commence processing after the next event is posted (block 96).

The multi-threaded architecture of the kernel 52 is illustrated in FIG. 11. The kernel 52 preferably initiates all module threads (e.g., thread 98) with an event. A module 54 can post an event or send an event that is stored in a shared data structure (block 100). The event is added to the kernel event queue 58 (block 102). The kernel 52 regularly checks the events in the kernel event queue 58 and can retrieve an event at a later time (block 106), as indicated by the broken line 104. The event is dispatched to the correct destination DDS module 54 via its own kernel thread (block 108). The event queue is not accessible to other threads when modules are posting events or when the kernel is retrieving events.

FIG. 12 illustrates kernel event flow, as well as function calls. An operating system event is retrieved from the operating system event queue 68 (block 110) and translated into a kernel event (block 112). The dispatcher 60 resolves the destination of the kernel event (block 114) and dispatches it to the destination DDS module 54 for posting in its module event queue 60 (block 116). The DDS modules 54 can post events to the kernel event queue 58 (block 118). The dispatcher 60 determines whether the events call for the initialization or termination of processing by a particular module (block 120). In accordance with the affirmative branch of decision block 120 and block 122, the kernel loader 62 loads and unloads selected modules 54 depending on the event and object in question. The DDS modules 54 in turn load event(s) into the kernel event queue 58. When modules are not posting events, they are creating function

calls such as user interface registration service routines to look-up tables (block 124) for communication between the kernel 52, the operating system 51 and user interface devices 13 and 19 of the customer computer 12.

As shown in the flow chart of FIG. 12, the DDS modules 54 pass data to the kernel via events. The format of an event is preferably an eight field structure comprising the following fields: event type, destination, destination instance, source, source instance, time stamp, message and related data. The type of event can be signified using alpha-numeric codes which are defined in the kernel 52. The destination is the DDS module 54 to which the event is dispatched. The destination instance indicates to which of the destination module instances the event is dispatched. The source and source instance represent the DDS module 54 that posted the event and its corresponding instance. The time stamp field indicates the time at which the event was posted by the source module. The message and related data fields represent event-dependent data, and a pointer to where more event-dependent data is stored in memory, respectively. The format of the event data passed from the kernel 52 to the DDS modules 54 is preferably the same as the format of kernel inputs from the DDS modules. As stated previously, the kernel 52 primarily responsible for dispatching events to the DDS modules 54, loading and unloading selected DDS modules 54 to and from the hard drive 15, providing service routines to the DDS modules 54, as well as module registration services.

Every DDS module 54 preferably comprises a module information resource record (MIRR) 128 which contains information used by the kernel 52 for initializing and deinitializing the DDS modules 54. FIG. 13 depicts an exemplary MIRR for the DDS start-up module 54c. The MIRR 128 comprises a number of fields, including a Module Identification field 130 which comprises a unique identification code that was assigned to that module during the module development process. The Storage Type field 132 indicates how the module is stored, for example, as a Macintosh 680x0 platform module or a PowerPC platform module. The Events Accepted Mask field 134 indicates which events should be dispatched to that particular module such as an idle event, mouse events, keyboard events, update and activate events, disk events, operating system events and high-level events. The operating system events and high-level events can preferably be dispatched to only one module 54 in the kernel 52. The mouse events and keyboard events are dispatched preferably to only user interface modules.

Module Version field 136 and the Kernel Version field 138 in an MIRR 128 indicate the current version of the module 54 and the lowest version of the kernel 52 that supports the module 54, respectively. The Module Checksum and Signature fields 140 and 142 are used by a system requester module 272, which is described below, to ensure that a particular module 54 is error-free, is registered, and comes from a valid source (i.e., has not been altered). The Module Type field 144 represents high-level information about a DDS module 54 that is available to other modules 54 for routing purposes. This field indicates what groups of modules 54 a particular module 54 belongs to. For example, module types can include a start-up module, a data viewer module, a hierarchy viewer module and a dataset location addition module. The Module Data Type field 146 contains high-level information about what type of data the module can process and is used mainly for data viewer modules. For example, a module that displays Graphics Interchange Format (GIF) files would have GIF-type module data. The

Module Creator field 148 contains information about who developed the module and which can be used to identify families of modules.

The MIRR 128 comprises a number of flags. The Uses Local Resources flag field 150 indicates, for a module supported by a Macintosh operating system, whether or not its resource fork is open or closed. The Has User flag field 152 indicates whether or not the module makes use of user interface functions in the host operating system. The Can Be Threaded flag field 154 indicates whether or not a module is compatible with running on its own thread and supports asynchronous event posting. The Is Application Code flag field 156 indicates that the module has no knowledge of the kernel 52 or DDS 10 and is a standard PowerPC container in a Macintosh operating system. If this flag 156 is set, the kernel 52 executes this module on a special module 54 thread. The Stream Module flag field 158 indicates if a module is a stream-type module. As will be described in further detail below, modules are classified as a stream module, a DDS UI object module or a user interface module. The DMS Compliant flag field 160 indicates whether or not the module is compliance with proposed Distributed Module Services (DMS) standards. The remaining fields 162, 164, 166 and 168 are reserved.

Most modules 54 in the DDS 10 are user interface (UI) modules which usually register a window on the display device 13 and use the host operating system's user interface and screen drawing libraries. UI modules are preferably the only modules to receive user interface-type events from the operating system 51. Stream modules process a dynamic stream of data. For example, a module that decompresses or encrypts a data stream is a stream module. If a module uses any functions from the Macintosh QuickDraw libraries, it is preferably a user interface module in order to be compatible with the Copland BlueBox standard. DDS UI object modules interface directly with the kernel 52 and are identified by the presence of an MIRR resource in the resource fork if they are created using the MacOS or MIRR file. A UI interface module controls the contents and activities of one or more windows, such as a GIS previewer module which generates the screen depicted in FIG. 7. A DDS UI object module is a module that is responsible for a specific area on a window such as "accept" button 170. A UI object module is written according to UI object specifications and is called using function calls from the DDS modules 54.

External modules can be provided in the DDS 10 which are developed according to a different module architecture than that used with the DDS 10. External modules are supported by wrapper DDS modules that enumerate, translate communications for, and otherwise maintain external modules. The DDS 10 is designed to have a Netscape plug-in module to accommodate plug-ins designed for use in the Netscape Navigator software. Plug-in modules can also be provided for a JAVA Applet and a MacOS application.

The various DDS modules 54 will now be described in further detail with reference to FIG. 14. The screen depicted in FIG. 14 can be generated by the kernel 52 to allow an information provider or operator at the fulfillment center 14 to view the different module options and to create a custom DDS 10 or to modify or create new modules 54. These modules represent a set of modules which can be potentially downloaded to the hard drive 15 of a customer computer 12 by the kernel 52 whenever necessary. It is to be understood that other DDS modules 54 can be developed and used with the kernel 52 in addition to the ones depicted in FIG. 14.

Following start-up, the customer computer 12 is provided with at least one of the user interface or preview modules

172 which allow the customer to search for and view the available datasets by title, for example, and to preview particular datasets in the DDS 10. These modules 172 can generate screens which provide the customer with instructions for purchasing selected datasets. Exemplary GIS previewer and purchasing screens are depicted in FIGS. 15 and 16. For example, the GIS screen 173 depicted in FIG. 15 provides the dataset item (i.e., 4 meter aerial orthophotography), the group (i.e., Greater Vancouver Regional District map), the dataset price, as well as instructions to preview or purchase the data by double-clicking on the "preview" and "purchase" parts 174 and 176 on the screen, respectively. The Full Content search UI module 178 provides a user interface for searching for a particular dataset based on, for example, text or key words entered by the user. The Purchase Window screen 180 provides a user interface for a purchase window 181 such as that shown in FIG. 16. Upon entering a product code 182 for a particular dataset and clicking on the "purchase" button 184, a release code 186 is generated by the fulfillment center 14 and either automatically displayed on the screen 181 or given verbally to the customer over the telephone by an operator at the fulfillment center 14. The Generic Purchase module 188 provides a user interface for creating a customized purchase screen and transaction similar to the screen 181 shown in FIG. 16.

With continued reference to FIG. 14, the Progress Indicator module 190 provides the user with progress feedback during downloading, decompression and decryption of datasets after the release code has been entered by the customer. The License module 192 and the Network Purchase module 194 are user interfaces for license windows and options and for site license network-based purchasing, respectively. The DDS Toolbox Parts module 196 provides the customer computer 12 with base parts used in the DDS system 10 such as a scrolling text box. The Hierarchy Display module 198 displays relationships and the organization of data on, for example, a CD-ROM, as well as allows navigation through the data. The Textual Preview module 200 provides for the display of previews of datasets for the customer. The Joint Photographic Experts Group (JPEG) UI object module 202, the Motion Picture Experts Group (MPEG) UI object module 204, and the Tagged Image File Format (TIFF) UI object module 206 provide for the display of a JPEG image, the playback of an MPEG video stream and the display of a TIFF image, respectively. Two specialized search modules 207 are provided, although other search modules can be added. The Full Content Search module 208 allows for data stored in any of the DDS datasets to be searched, and works in conjunction with the Full Content Search UI module 178 that operates the screen and user input devices for entering key words. The AltaVista Search Gateway module 210 provides for searching for related information on the worldwide web using a gateway and the AltaVista search engine. The External Module support modules indicated at 212 include a Netscape plug-in UI object 214, which allows Netscape plug-ins to be used by the DDS 10 as if they were a native DDS UI object, and a JAVA Applet UI object 216, which allows JAVA Applets to be used as if they were a native DDS UI object.

FIG. 14 does not display a number of modules, such as the start-up module 54c, and the system requester module 272, which manages data requests, performs information routing and caching and is described below. Further, a Facsimile Transaction module is available but not shown in FIG. 14. The Facsimile Transaction module provides a user interface for automatically generating a facsimile purchase form. A

Portable Font UI object is also provided (but not shown in FIG. 14) to display text in a specific font with specific formatting.

After a customer has requested the purchase of a dataset, a number of transaction modules 217 are supported by the DDS 10 for authorizing the purchase and for managing the payment transaction. For example, the Internet Transaction module 218 and the Phone Transaction module 220 support financial transactions occurring over the Internet or other communication network and a telephone, respectively. The Fulfillment Center module 222 provides customized information for contacting a third party fulfillment center. The remaining modules 224, 226 and 228 allow the use of different credit cards or bank account debit cards as payment options.

The local and remote access modules 230 are shown in FIG. 10. The CD-ROM Requester module 232, the TCP/IP session manager module 235 and the TCP/IP Requester module 236 are selected as needed by the system requester module 272 and downloaded to the customer computer 12 to access and pay for datasets located on a CD-ROM 18, an Internet 32 or at a web site 30, respectively. Other local/remote access modules can be developed for retrieving data from different information sources. For example, an ODBC Requester module (not shown) can be created or connect the computer 12 to an Oracle RDBM server 28 via a local area network or Internet. Different specific requesters can be developed for various communication technologies, such as satellite communications, radio frequency or microwave communications, among others.

The DDS 10 can provide a number of different security/encryption modules 238 to handle various encryption protocols, such as modules 240, 242, 244 and 246 for handling, respectively, the Visa-Mastercard electronic commerce protocol (SET), the secure socket layer link encryption standard developed by Netscape (SSL), the Data Encryption Standard (DES) algorithm, and the Rivest, Shamir and Adelman (RSA) encryption algorithms and protocols.

Similarly, the DDS 10 modules 248 can provide information providers with options regarding the compression and decompression of datasets to be sent to customers, such as module 250 for run length encoding (RLE) compression of certain image formats at the computer 12, module 252 for the decompression of JPEG images, module 254 for the decompression of GIF images and text, and module 256 for the decompression of an MPEG video stream, among others. As stated previously, third party modules and module formats 258 are available, such as a CGM display module 260 for handling a Netscape plug-in for playing back a computer graphic metafile format image, or an imbedded JAVA Applet 262.

The modular architecture of the DDS 10 allows it to be more flexible as an information source than most existing data distribution systems. The modularity of the DDS architecture also allows adoption of other existing standards, as well as future standards, for such processes as file formatting (e.g., the Drawing Changes Format (DXF), the Macintosh PICT and the CGM standards), communications (e.g., the TCP/IP, HyperText Markup Language (HTML) and the HTTP standards), data manipulation (e.g., the JPEG and the MPEG compression algorithms) and security applications (e.g., the DES, RSA RC4 and Netscape's SSL encryption algorithms) with relative ease. Further, the modular architecture allows datasets to be written to substantially enter media without modification, such as CD-ROM, the Internet,

digital audio tape, hard drives and PC cards. The DDS 10 can operate on substantially any operating system without modification, such as the DOS, WINDOWS, Macintosh and UNIX operating systems. As stated previously, the modular architecture is implemented using the kernel 52 for execut-
 ing events, mapping operating system events into DDS
 events, loading and unloading modules 54 as needed and
 managing their instances separately, and supplying user
 interface registration services to facilitate operating system
 event dispatching.

In accordance with another embodiment of the invention, an information provider can use the DDS 10 to perform many of the functions of the fulfillment center. The DDS 10 comprises software which allows information providers to configure their own datasets, as well as implement their own services, such as distribution of datasets and payment. Information providers 11 can purchase a base kernel 52, as shown in FIG. 17, with as many additional DDS software modules 54 as desired to build a customized data distribution system. The base kernel 52 the Hierarchy Display and Preview Modules 198 and 200, one of the Purchase modules 217, one of the Encryption modules 238 and one of the Compression modules 248. As shown in FIG. 18, an information provider 11 may wish to use customized software modules 239, 199 and 219, for example, to implement a proprietary encryption algorithm or use their own user interface and purchase transaction technology. Further, the information provider 11 can build a modular architecture having these customized software modules and upgrade the architecture on a modular basis, thereby avoiding significant programming changes. This is an advantage over monolithic data distribution systems requiring information providers to purchase a large system that is difficult to modify.

The modular architecture of the kernel 52 allows for the development of an abstraction layer such that the location of desired datasets is transparent with respect to the modules 54. With reference to FIG. 19, a number of requester modules, which are shown within the abstraction layer 270 of the kernel 52, are provided to allow independence of the DDS modules 54 from the transport technology and storage of the datasets. The abstraction layer 270 comprises a system requester 272 and a number of specific requester modules 234, 232 and 278 corresponding to different dataset locations, such as a WWW server 30, a CD-ROM 18 and an object database server 28 (e.g., an Oracle RDBM server). Communication between the DDS 10 and other medias or operating environments is implemented by developing additional requester modules. When an individual DDS 54 module posts an event, such as downloading a selected dataset, the system requester 272 which maintains a database of the location and version of all available datasets in the DDS 10, directs the request from the source DDS module to the specific requester module for handling the retrieval of the selected dataset. For example, a DDS module 54 requesting information residing on an Internet server is forwarded to the TCP/IP requester 234.

FIG. 20 illustrates the flow of data between the kernel 52, the operating system 51 of the customer computer 12 and an information provider's site having, for example, a Hyper-Text Transfer Protocol or HTTP server 286. In the illustrated example, a module 54 initiates a request for a selected dataset comprising a blue square. This results in a function called to a kernel service library which creates a user interface object for the customer display device 13. The system requester 272 determines whether or not the requested dataset is located on the hard drive cache 15 of the customer computer 12.

The system requester 272 maintains a location database table 288, a portion of which is shown in FIG. 21. The location database table 288 identifies each dataset by name 28 (e.g., sample image, purchasable item), a unique identification number 283 (i.e., a 64 bit code) and the type of data 285. The data type can be a root item which is essentially equivalent to a disc, a group item which is essentially equivalent to a directory on the disc, and an item or file within the root or one or more groups. The attributes 287 of the data can be, for example, secured, encrypted, locked, read-only, unavailable, size of the data, date created, date last modified, type, the name of the creator, among others. A field 289 within the location database also provides for variable data to be entered for each dataset, such as whether or not the dataset is a root identifier, is image data, or an executable file.

Using the location database table 288, the system requester 272 determines where the dataset is located, such as on a CD-ROM 18 or on one of a number of web servers 30. If an item is stored in more than one location, the system requester 272 can determine from which location the dataset can be downloaded to the hard drive 15 in the least amount of time. In the following example, a blue box dataset is located on a server 286. A stream request, therefore, is sent by the system requester 272 to the TCP/IP requester 236. The stream request can be a request to open a stream, close a stream, to list a directory or to obtain file information. The TCP/IP requester 236, in turn, sends session operations data to the TCP/IP session manager 234 which comprises a connection request to the Internet. The session manager 234 preferably maintains communication with the operating system 51 while the stream request is processed. The operating system 51 in turn maintains a connection with the fulfillment site, that is, the HTTP server 286 at an information provider's 11 facility, via a conventional OS TCP/IP software module 291 and an external data interface on the customer computer 12.

With continued reference to FIG. 20, the requested data stream is sent from the HTTP server 286 to the customer computer 12, along with control data required for its transmission, via the operating system 51 and the external data interface. While the session manager 234 maintains communication with the operating system 51, a user interface object is posted by the kernel 52 to the kernel event queue 58 which has been translated from an operating system event. The data stream is managed by the session manager 234 and the TCP/IP requester 236 and is passed to the system requester 272. Communication between the system requester 272 and the session manager is preferably accomplished using DDS events, kernel function calls and shared buffers at the customer computer 12. The user interface object obtains the stream file from a shared buffer and verifies that it is the requested data.

An event is then posted in the module event queue 60 corresponding to the source module 54. The module 54, in turn, retrieves the event from its module queue 60 and completes processing of the data stream.

The communication between the requester modules will be described in more detail with reference to FIGS. 22-25. The system requester 272 transports an open stream to the TCP/IP requester 236. The TCP/IP requester 236 requests an open communication from the session manager 234 to establish a connection with an information source computer at a particular port (e.g., server 286). The connection is then completed through the operating system TCP/IP interface 291 to the HTTP server 286. As shown in FIG. 23, the system requester 272 can send an open stream input signal,

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a closed stream input signal, as well as directory listing and file information signals to the TCP/IP requester 236. The TCP/IP requester 236 uses a requester stream manager 290 to translate the open and closed stream input signals into session management input signals 292 for the session manager 234, such as open connection, close connection, get connection status, read from connection and write to connection. The directory listing and file information can also be interpreted and translated by an information request sessions translator 294 into an input signal for the session manager 234, apart from the open and close stream input signals.

With reference to FIG. 24, the session manager 234 processes the input signals using a connection manager 296 and operates an interface 298 with the Internet, as well as read and write buffers 300 for connections thereto. The high level functions of the TCP/IP session manager are shown in FIG. 25. The Create process 302 creates and initializes required data structures and buffers, validates the dataset location and attempts to create a connection with the host computer 286 specified by that location. The Destroy process 304 closes a specific open connection and any associated buffers. The Read From Connection process 306 prepares buffers and a connection to allow incoming data on that specific connection to be captured for use. The Write To Connection process 308 writes specific data to a specific connection. The Connection Maintenance process 310 monitors the status of connections, attempts to recover lost or error-prone connections and notifies related processes about errors and changes in status. The Get Status process 312 generates data streams reporting connection sites. The information request session translator 294 manages a specialized connection through the session manager 234 to acquire file information or a directory listing. The returned information is then formatted into a data structure and returned to the system requester 272 as a stream.

The DDS requester technology is advantageous because it isolates the DDS 10 from the location of the data. A dataset could reside on a CD-ROM 18, on a corporate Internet 32, on a relational database server 28 or a web server 30 and can be accessed without requiring changes to the DDS modules 54. Datasets can be downloaded, as well as data for product updates and additional function calls, without substantial rewriting of code for existing DDS modules 54.

As stated previously, the DDS can 10 use a computer-dependent release code to release encrypted data to a customer. The process of generating release codes will be described with reference to FIGS. 26-29. Raw and unencrypted data in a digital format is stored in independent data files at, for example, an information provider data processing facility, as shown in block 316 in FIG. 26. The data is encrypted using a selected encryption algorithm (block 318). The key for encrypting and decrypting the data is preferably generated cryptographically using a random number generator (block 320). The encrypted data is then stored in a database at a particular location (block 322). The encrypted data can be stored, for example, as a dataset on a CD-ROM 18 accessed at an HTTP server 30 or at a customer computer. A unique dataset code is assigned to the dataset and is preferably generated using a hash algorithm on the location of the dataset (block 324). The location of the dataset, the key and the hashed dataset code are then stored in a key management database maintained at the fulfillment center 14 (blocks 326 and 328), and the encrypted data is distributed (block 330) on the CD-ROM 18, for example, or made available on the network 22.

As shown in FIG. 27, a user can select a dataset and initiate a request by clicking on an item in a preview screen,

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for example (blocks 332 and 334). A hardware-dependent digital signature (HDDS) is generated in response to the dataset request (block 336). The signature can be based on a card number of a board within the customer computer or other computer-specific device. The location of the selected dataset is determined by the computer using a table on the CD-ROM 18 or available via the network 22 and preferably hashed (block 338). The hashed location is then concatenated with the HDDS and compressed to present the user with a product code corresponding to the selected dataset (blocks 340 and 342).

As shown in FIG. 28, the product code is forwarded to the fulfillment center 14 (block 344), where it is processed to decompress the product code, and to extract the hashed location of the selected dataset and the HDDS (block 346). The hashed location is used to find the key within the key management database for decrypting the requested dataset (blocks 347, 348 and 349). The HDDS is then hashed (block 350) and encrypted along with the key (block 351). The encrypted key is concatenated with the hashed dataset code (block 252), compressed, and sent as a release code to the customer (block 354).

With reference to FIG. 29, the customer enters the release code into an authorization screen generated on the customer computer (block 356). The release code is then decompressed (block 358). The hashed dataset code based on the dataset location, and the encrypted key using the hashed HDDS, are extracted from the release code. The hashed dataset code is processed to ensure that the key is being provided to an authorized customer computer (block 360, 362, 364 and 366). For example, the location of the selected dataset can be hashed and then compared with the hashed dataset code. The rehashing of the dataset code is preferably performed independently of the encrypted hashed HDDS and key combination. The digital signature HDDS is regenerated (blocks 368 and 370) to decrypt the key (blocks 372 and 374). The HDDS is regenerated independently of the release code to further protect against use of the release code on an unauthorized computer. The decrypted key is then used to unlock the selected dataset to the user (block 376).

The generation of the product and release codes in the key management system are advantageous when granting authorization to customers to access datasets because the product code and release codes are linked to the source computer. The transmission of both of the product codes and release codes described herein between the customer computer 12 from which the dataset was requested and the information provider 11 computer or fulfillment center 14 granting authorization ensures that the release code successfully decrypts the dataset on only an authorized computer. In accordance with the present invention, an unauthorized computer may be able to obtain a release code; however, the dataset is not likely to be successfully decrypted into meaningful information. This is because the key for decryption must also be decrypted using a hardware signature of the requesting computer 12 which is derived independently of the release code.

While certain embodiments have been chosen to illustrate the invention, it will be understood by those skilled in the art that various changes and modifications can be made herein without departing from the scope of the invention as specified in the claims.

What is claimed is:

1. A modular kernel for managing events and function calls processed at a customer computer in a system for distributing digital data among a plurality of customers, the data being provided to the system by at least one information

provider and stored in a plurality of datasets, the system having a transaction processing device for maintaining a database comprising the storage locations of the datasets and the cost of accessing the datasets, the kernel being used in conjunction with a host operating system on the customer computer, the kernel comprising:

a kernel operating system interface module for managing communication between said kernel and said operating system by translating operating system events generated by said operating system into at least one of said events;

a plurality of kernel modules selected from the group consisting of a module for accessing said data at a local one of said storage locations, a module for accessing said data at a remote one of said storage locations, a module for data encryption and decryption, a module for data compression and decompression, a credit card payment module, a telephone transaction module, a communication network transaction module, a module for searching said data, a module for previewing at least part of said data, an external device plug-in module, a JAVA Applet module, an image file module, a video hypermedia file module, a image hypermedia file module, a start-up module, a deinitialization module and a bootstrap module, said kernel modules each being programmed to post said events with at least one of said operating system and another one of said kernel modules and to maintain a module queue for storing said events;

a kernel event queue, said kernel operating system interface and each of said plurality of kernel modules being programmed to post said events in said kernel event queue; and

a dispatcher module for retrieving each of said events from said kernel event queue and routing said events to one of said module queues.

2. A kernel as claimed in claim 1, wherein said kernel is maintained in a storage device that is independent of said computer, said kernel being programmed to initialize with only a subset of said plurality of said kernel modules, and said dispatcher being programmed to dynamically load and unload selected ones of said plurality of kernel modules between said computer and said storage device when desired, depending on which of said events said dispatcher retrieves from said kernel event queue.

3. A kernel as claimed in claim 1, wherein said storage locations are selected from the group consisting of a communication network, a database server, a web site server and a portable storage device, and further comprising at least one requester module programmed to automatically access and transmit said data to said customer computer while maintaining said storage location transparent to said plurality of kernel modules, said plurality of kernel modules being programmed to operate independently of different said storage locations.

4. A kernel as claimed in claim 1, further comprising at least one requester module for establishing, monitoring and terminating connections between said kernel and a digital communications network.

5. A kernel as claimed in claim 4, wherein said operating system is comprises a communications network stack for connecting to said network and said requester module is programmed operate in conjunction with said stack and post said events to said host operating system to receive said data from said network.

6. A kernel as claimed in claim 1, further comprising a plurality of specific requester modules for accessing and

retrieving said data from respective storage locations selected from the group consisting of a database server, a communication network, a web site and a portable storage device, and a system requester module for invoking one of said specific requester modules depending on the location of said data and transmitting said data to said customer computer, said system requester module and said plurality of specific requester modules being programmable to maintain said storage locations transparent with respect to said plurality of kernel modules.

7. A kernel as claimed in claim 1, wherein said customer computer comprises a local memory device, said system requester module being programmable to determine whether said data is located on one of said portable storage device and said local memory device before invoking one of said specific requester modules corresponding to said database server, said communication network and said web site.

8. A kernel as claimed in claim 1, wherein said customer computer has a user interface device, said kernel comprises at least one service routine for handling said user interface device and said plurality of kernel modules are each programmed to generate said function calls to said service routine to communicate with said user interface device.

9. A kernel as claimed in claim 1, further comprising different sets of said plurality of kernel modules, each of said sets being programmed in accordance with the respective application programming interface functions of different operating systems corresponding in number to said sets.

10. A kernel as claimed in claim 8, wherein said operating systems are selected from the group consisting of UNIX, WINDOWS NT, WINDOWS 95, WINDOWS 3.x and WINOS2 for the 80x86 architecture, WINOS2 for the PowerPC architecture, MacOS2 for the PowerPC architecture, and Mac for the 680x0 architecture.

11. A method of fulfilling a customer request for a dataset selected from a plurality of datasets comprising the steps of:

receiving a request via a user interface device at a customer computer having an operating system;

posting an operating system event into an operating system event queue;

retrieving said operating system event from said operating system event queue;

translating said operating system event into a kernel event for processing by a kernel;

determining which of a plurality of kernel modules is the destination module for said kernel event, each of said plurality of kernel modules having a corresponding module event queue, said plurality of kernel modules selected from the group consisting of a module for searching for said dataset among said plurality of datasets, a module for previewing at least part of said dataset, a telephone transaction module for ordering said dataset, a communications network transaction module for transmitting said dataset to said customer

from a network, a module for accessing said dataset at a local storage location, a module for accessing said dataset at a remote storage location, a module for performing data encryption and decryption on said dataset, a module for performing data compression and decompression on said dataset, a credit card payment module for purchasing said dataset, an external device plug-in module, an image file module, a video hypermedia file, module, an image hypermedia module, a start-up module for initializing each of said kernel modules, a deinitialization module for terminating operation of said kernel modules, and a bootstrap module; and

retrieving said data from respective storage locations selected from the group consisting of a database server, a communication network, a web site and a portable storage device, and a system requester module for invoking one of said specific requester modules depending on the location of said data and transmitting said data to said customer computer, said system requester module and said plurality of specific requester modules being programmable to maintain said storage locations transparent with respect to said plurality of kernel modules.

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dispatching said kernel event to said module event queue corresponding to said destination module.

12. A method as claimed in claim 11, wherein said destination module is programmed to establish a connection to a remote transaction processing system, said method further comprising the steps of:

locating said selected dataset;

completing a payment transaction with said customer computer via said transaction processing system to purchase said selected dataset.

13. A method as claimed in claim 12, wherein said customer computer comprises a local memory device and said plurality of kernel modules comprises a specific requester modules for accessing and retrieving said dataset from respective ones of a plurality of storage locations selected from the group consisting of a database server, a communication network, a web site and a portable storage device transparently with respect to other ones of said plurality of kernels and a system requester module for invoking one of said specific modules depending on where said selected dataset is located, said locating step comprising the step of determining whether said selected dataset is located in one of said local memory device and said portable storage device using said system requester module before invoking one of said specific requester modules corresponding to said database server, said communication network, and said web site.

14. A method as claimed in claim 12, wherein said connection is selected from the group consisting of a telephone conference between said customer and an operator at said transaction processing system, a facsimile transmission from said customer computer to said transaction processing system, transmission of dual tone multifrequency signals generated at said customer computer to said transaction processing system, and a communication network link between said customer computer and said transaction processing system.

15. A method as claimed in claim 12, further comprising the step of determining the level of authorization required to access said selected dataset using said transaction processing system.

16. A method as claimed in claim 11, further comprising the steps of monitoring said operating system event queue and retrieving a kernel event from said kernel event queue when no said operating system events have been posted in said operating system queue.

17. A method as claimed in claim 11, further comprising the steps of:

processing said event using said destination module;

generating a new event if event processing by one of said plurality of kernel modules is required; and

generating a function call to said kernel to execute a service routine if a selected function of said kernel is desired.

18. A method as claimed in claim 17, wherein said service routine is selected from the group consisting of generating window displays on a monitor connected to said customer computer, generating menus for display on said monitor, and managing said kernel modules.

19. A method of fulfilling a customer request for a dataset selected from a plurality of datasets comprising the steps of:

initializing a kernel stored on one of a portable data storage device and a remote data storage device accessed via a communication network to store and operate said kernel from a local memory device connected to a customer computer, said kernel comprising

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a plurality of kernel modules and being programmed to initialize with a subset of said kernel modules;

entering said request at said customer computer via a user interface device connected thereto;

determining where said selected dataset is located, the location of said dataset being selected from the group consisting of said local memory device, said portable data storage device, and said remote data storage device;

loading at least one of said plurality of kernel modules on said local memory device depending on said location of said dataset;

executing said kernel module to perform at least one of a plurality of functions comprising downloading said dataset to said local memory device if said selected dataset is currently on said portable data storage device, initiating a connection to said communications network if said dataset is not on said local memory device and is not on said portable data storage device, monitoring said connection, and terminating said connection after said dataset is transmitted to said customer computer.

20. A method as claimed in claim 19, wherein said determining step comprises the steps of:

determining whether said customer is authorized to access said dataset; and

generating a message on a user interface of said customer computer indicating when access is denied.

21. A method as claimed in claim 19, further comprising the steps of loading a transaction module on local memory device for establishing a connection to a remote processing device, and conducting a payment transaction with said customer computer to allow said customer to purchase said dataset via said remote processing device.

22. A method as claimed in claim 21, wherein said dataset is available on-line via said communication network and not downloaded, and further comprising the step of determining a price for purchasing said dataset for a predetermined period of time via said remote processing device.

23. A system for distributing data among a plurality of customers, the data being provided to the system as datasets by at least one information provider, comprising:

at least one customer computer having a memory device, a display device, a user interface device and a first processing device;

a fulfillment center adapted for communication with said customer via at least one of a telephone and a communication network interface for transmitting digital data, said fulfillment center comprising a second processing device; and

a plurality of data storage devices comprising a portable storage device and a shared memory device accessible via a communication network, said datasets from said information provider being stored on said at least one of said plurality of data storage devices, said first processing device being programmable to generate a request for a selected one of said datasets comprising a product code corresponding to said selected dataset and to transmit said request to said second processing device via said telephone line if said at least one data storage device is a portable storage device installed at said customer computer and otherwise via said communication network, said second processing device being programmable to process said request to determine if said customer has authorization to access said selected dataset, to generate a release code and to transmit said release code to said customer computer

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via said telephone line if said selected dataset is stored on said portable storage device installed at said customer computer and otherwise via said communication network, said first processing device being programmable to receive said release code and to download said selected dataset from said plurality of storage devices to said memory device.

24. A system as claimed in claim 23, wherein said first processing device is programmed to display a brief description of a number of said datasets on said display device to allow said customer to preview said corresponding datasets before generating said request.

25. A system as claimed in claim 23, further comprising a system requester software module and a network communications module, said first processing device being operable in accordance with said system requester software module to determine on which of said portable storage device and said shared memory device said selected dataset is stored and to selectively initiate said network communications module when said selected dataset is stored on said shared memory device, said network communications software module being operable to establish and terminate connections between said customer computer and said communications network.

26. A method of distributing data among a plurality of customers computers, the data being provided to the system as datasets by at least one information provider, the method comprising the steps of:

storing said datasets in at least one of a plurality of data storage devices comprising local portable storage device for use with said customer computers and a shared memory device accessible via a communication network;

providing at least one of said customer computers with a kernel;

generating a request signal in response to said customer selecting one of said datasets using a user interface device connected to said customer computer;

determining the location of said selected dataset in said plurality of data storage devices;

transmitting said request to a remote processing center via a communications network link if said selected dataset is not stored in said portable storage device;

establishing a telephone connection to said remote processing center if said selected dataset is stored in said portable storage device;

completing a payment transaction with said computer via one of said telephone connection and said communications network link to purchase said selected dataset; and

transmitting a release code to said customer computer for accessing said selected dataset.

27. A method of authorizing customer access to secured datasets comprising the steps of:

collecting raw data from at least one information provider;

encrypting said raw data using an algorithm and a cryptographically generated key;

storing said raw data as individual datasets having respective locations in a key database;

storing said key in said key database;

encrypting each of said locations of said datasets; and

storing said encrypted locations in said key database.

28. A method as claimed in claim 27, wherein said step for encrypting said location comprises the step of encrypting said signature using a Hash algorithm.

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29. A method as claimed in claim 27, further comprising the steps of:

selecting one of said datasets using a computer;

generating a signature corresponding to said computer;

determining said location of said selected dataset using said computer and encrypting said location;

combining said encrypted location of said selected dataset and said signature into a product code corresponding to said selected dataset.

30. A method as claimed in claim 29, wherein said step for generating said signature comprises the step of deriving said signature from a hardware component in said computer.

31. A method as claimed in claim 29, further comprising the steps of:

transmitting said product code to a processing device programmable to access said key database;

generating a release code using said key corresponding to said selected dataset; and

transmitting said release code to said computer to decrypt said selected dataset.

32. A method as claimed in claim 31, wherein said remote processing device being programmable to perform financial transactions and to determine the price of said selected dataset and further comprising the step of establishing credit for a user at said computer before transmitting said release code.

33. A method as claimed in claim 29, further comprising the steps of:

extracting said signature and said encrypted location for said selected dataset from said product code using a processing device that is programmable to access said key database;

locating said selected dataset in said key database using said extracted encrypted location of said selected dataset;

extracting said key corresponding to said selected dataset from said key database;

encrypting said signature;

encrypting said key corresponding to said selected dataset using said encrypted signature; and

generating a release code by combining said encrypted key with said encrypted location corresponding to said selected dataset and stored in said key database.

34. A method as claimed in claim 33, further comprising the steps of:

processing said release code using said computer to extract said encrypted key, and said encrypted location corresponding to said selected dataset and stored in said key database, therefrom;

verifying said computer using said encrypted location corresponding to said selected dataset and stored in said key database and said encrypted location of said selected dataset generated during said determining step;

generating a second signature corresponding to said computer;

encrypting said second signature;

decrypting said encrypted key using said encrypted second signature; and

decrypting said selected dataset using said decrypted key.

* * * * *



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(54) **METHOD AND APPARATUS FOR PROVIDING NETWORK ACCESS FOR PDA DEVICES**(30) **Foreign Application Priority Data**

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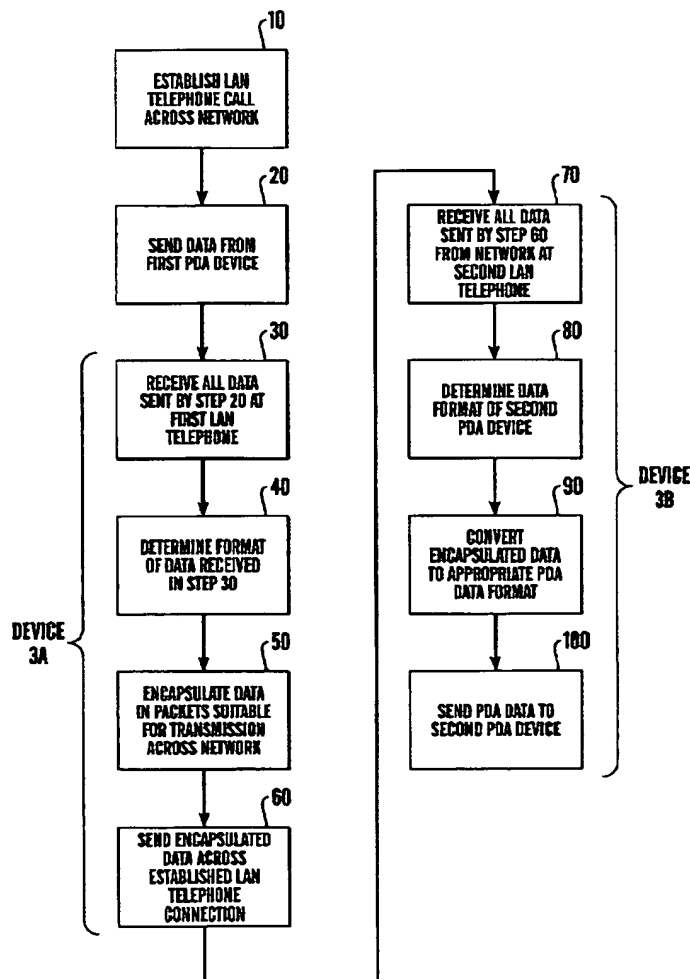
(73) Assignee: 3Com Corporation

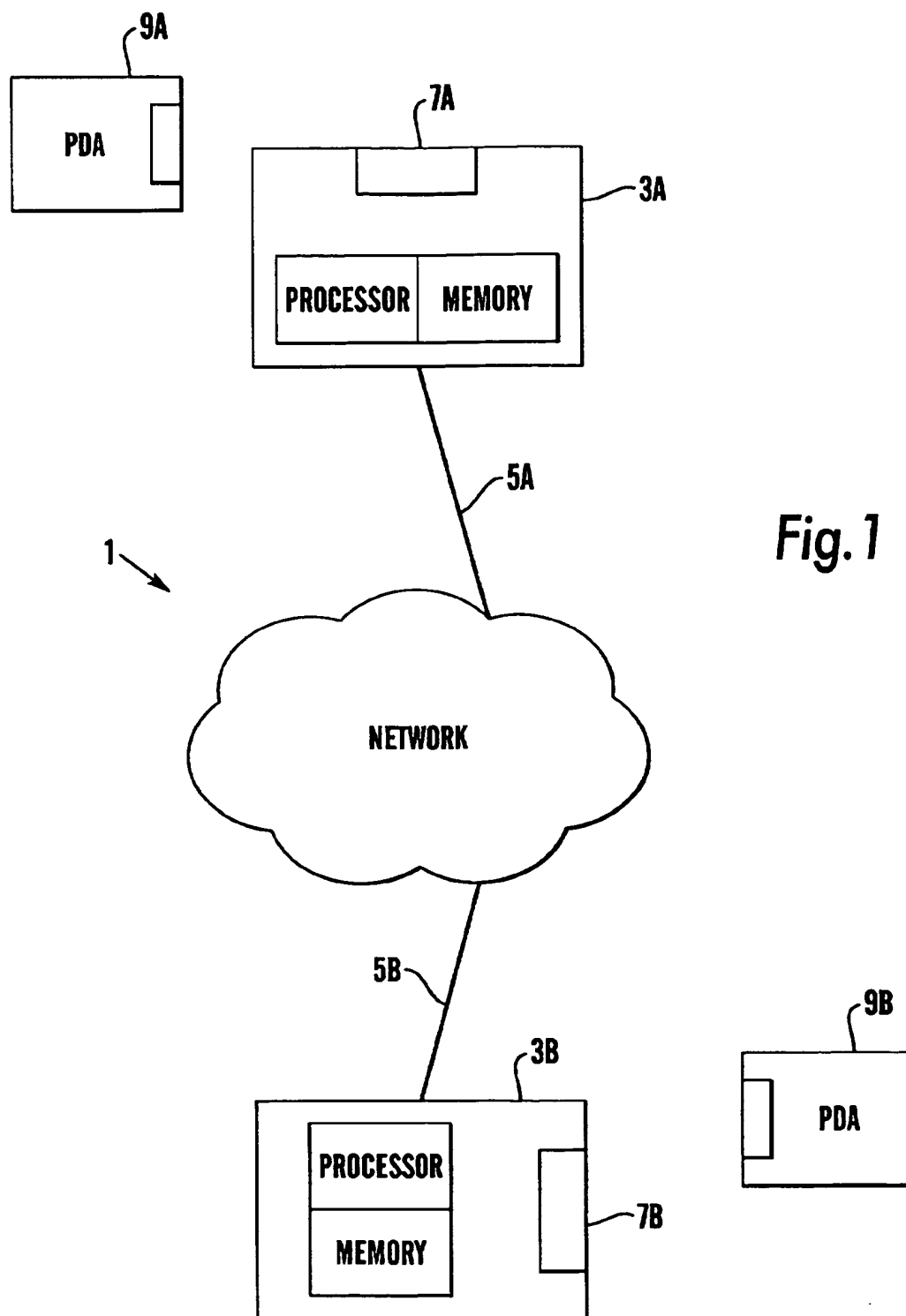
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(57) **ABSTRACT**

A method and apparatus for communicating data from a Personal Digital Assistant (PDA) device over a network is described. In a preferred embodiment, the data is received from the PDA device by a network device through a short-range wireless interface. The network device determines the format of the received data and converts it to a data packet format suitable for transmission across the network.





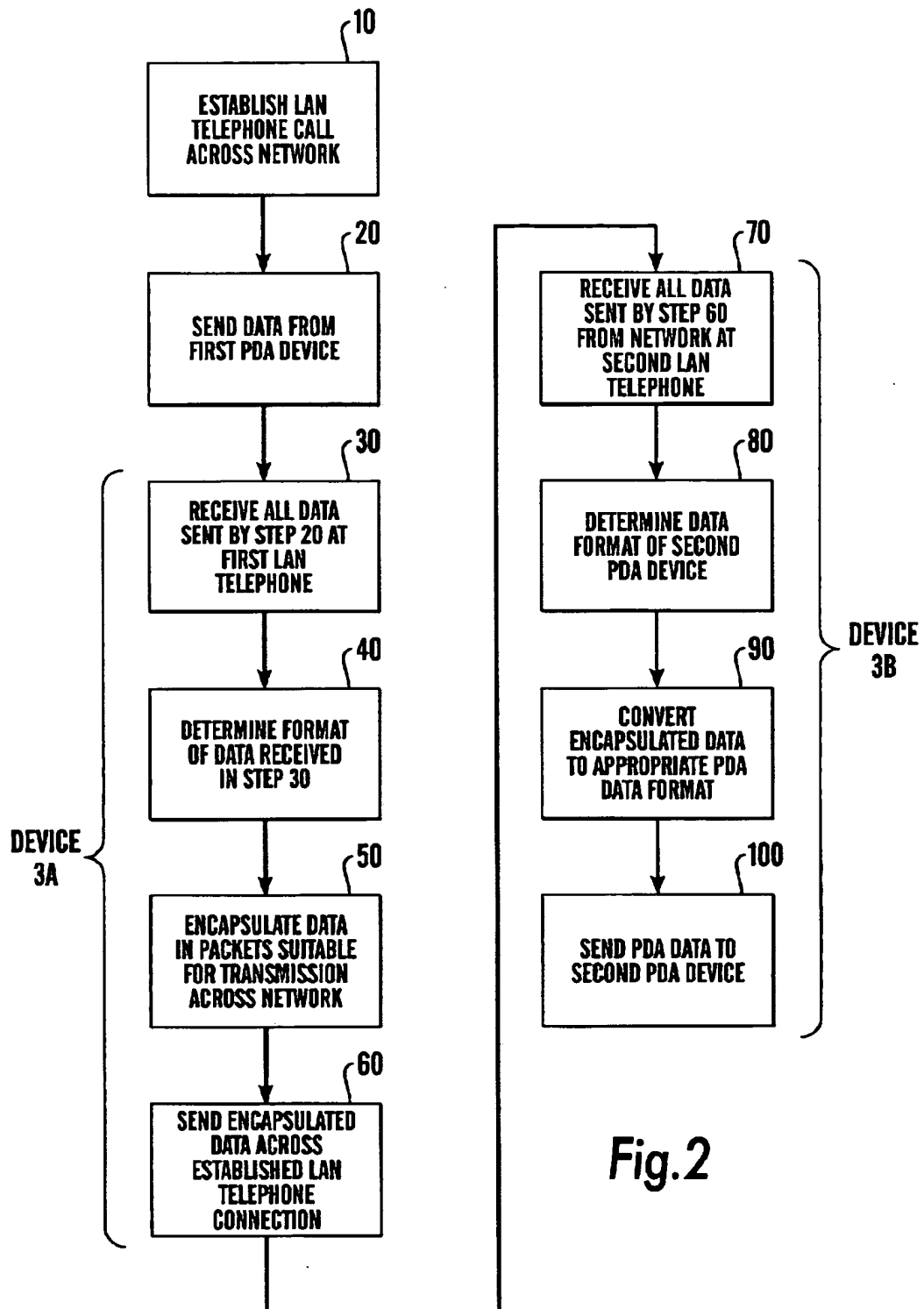


Fig.2

METHOD AND APPARATUS FOR PROVIDING NETWORK ACCESS FOR PDA DEVICES

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to data communications networks, and more specifically to a method and apparatus for providing access to such networks by Personal Digital Assistant devices (hereinafter referred to as "PDA devices").

[0003] 2. Description of the Related Art

[0004] Data communications networks are being used more and more for communications in the business environment. Such networks comprise a plurality of "network devices" including computers, peripherals and other electronic devices capable of communicating with each other by sending and receiving data packets in accordance with predefined network protocols. Except in the case of wireless networks, each network device is connected to the network media, which in the case of a LAN (Local Area Network) or WAN (Wide Area Network) may be coaxial cable, twisted pair cable or fibre optic cable. A network is generally configured with core network devices having a plurality of ports, which can be used to interconnect a plurality of media links on the network. Such devices, which include hubs, switches and routers, pass data packets received at one port to one or more of its other ports, depending upon the type of device.

[0005] The TCP/IP group of protocols is commonly used in most modern networks to allow data to be communicated across the Internet. Data packets formatted according to these group of protocols contain address information in the header of each data packet, namely the IP address of the source network device and the IP address of the destination network device, in order to enable routing of the data packets across the network.

[0006] In addition to data communication, businesses are increasingly using their LAN and WAN networks for telecommunications. The ability to communicate voice, as well as data, across networks by IP telephone devices using the Voice-over Internet Protocol (VoIP) has enabled the convergence of telecommunication and data communication networks.

[0007] In addition to the increasing use of the resources provided by networks, PDA devices are widely used by individuals in the course of their business. PDA devices are small portable devices which store information such as address book and calendar information for use by the individual. PDA devices typically use unique protocols, particular to the PDA vendor. However, PDA data can be downloaded from a PDA device to a personal computer for back-up purposes. In addition, some PDA devices have an IrDA (Infrared Data Association) interface which enables exchange of data from PDA to PDA over a relatively short distance (about 1 meter). Such PDA devices include the PalmPilot available from Palm, Inc. of Santa Clara, USA. Data is exchanged between two such PDA devices using an appropriate PDA data format or protocol, which is recognised by, and compatible with, the software application running on the PDA.

[0008] It would therefore be desirable to make more effective use of PDA devices, and in particular improve the range across which data can be communicated from and to PDA devices.

SUMMARY OF THE INVENTION

[0009] In accordance with a first aspect, the present invention provides a method for communicating data from or to a Personal Digital Assistant (PDA) device over a network, the method comprising: receiving data from a PDA device in a PDA format, and converting the received data to a format suitable for transmission across the network.

[0010] Preferably, the method includes the step of determining the format of the received data and converting the data accordingly.

[0011] Thus, the present invention provides the ability to communicate data from a PDA device across a network to a network device. In addition, in a preferred embodiment, the method enables the data transmitted across the network to be received at a network device and transmitted to another PDA device.

[0012] In a preferred embodiment, the present invention is implemented in a network device and utilises hardware, in the form of a wireless interface (e.g. implementing IrDA protocol or Bluetooth) to receive data from and transmit data to a PDA device. In addition, the preferred embodiment of the present invention utilises software in which data received from a PDA in a relevant PDA protocol is converted to an appropriate network protocol, for example IP (Internet Protocol) for TCP/IP networks. The converted data may then be passed across the network to another network device.

[0013] In accordance with a second aspect, the present invention provides a method for communicating data to a Personal Digital Assistant (PDA) device from a network, the method comprising: receiving data from the network in a network compatible format, and converting the received data to a PDA format suitable for transmission to a PDA device.

[0014] In accordance with a third aspect, the present invention provides a computer program for carrying out the method in accordance with the first and/or second aspect of the present invention.

[0015] In accordance with a fourth aspect, the present invention provides a network device configured to receive data from a PDA device in a PDA format using a short range wireless link, and configured to convert the received data to a format suitable for transmission across a network.

[0016] Other preferred and optional features of the present invention will be apparent from the following description and accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

[0018] FIG. 1 schematically illustrates the use of the present invention for communicating data from a PDA device to another PDA device across a network, and

[0019] FIG. 2 is a flow diagram showing the method steps performed in communicating the data between the PDA devices illustrated in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] FIG. 1 illustrates a first network device 3A forming a fixed node on a network 1. The network device 3A may be a LAN telephone device or laptop device capable of sending and receiving data and voice communications on the network 1 using, for example, TCP/IP protocols including the IEEE 802.2 Link Layer protocol. In the following description, the network 1 utilises TCP/IP (OSI layer 3) protocols. The skilled person will appreciate that the present invention may also be implemented in networks which send voice communications using Ethernet (OSI layer 2) protocols, or proprietary protocols.

[0021] Network device 3A thus includes conventional hardware in the form of a processor and memory, and software applications for handling data and voice communication.

[0022] In addition, in accordance with the present invention, the network device 3A includes a wireless interface 7A for sending and receiving wireless data communications. The wireless interface 7A may implement the IrDA protocol, Bluetooth or other relatively short-range wireless protocols implemented for communication with PDA devices.

[0023] A first PDA device 9A, having a wireless interface compatible with the wireless interface 7A of network device 3A includes memory storing data in PDA format.

[0024] In the present example, an individual wishes to communicate data from his PDA device 9A to the PDA device 9B of a second individual at a remote location from the first individual.

[0025] In accordance with the present invention, the network device 3A may be used as a network access point by the individual wishing to communicate the data from the PDA device 9A. The second individual wishing to receive the data in his PDA device 9B can similarly use a second network device 3B, similar to the network device 3A, which is connected to the network by media link 5B.

[0026] In particular, the first individual operates the PDA device 9A to transmit the PDA data from PDA device 9A to the network device 3A. The network device 3A receives the PDA data at wireless interface 7A, determines the PDA format and converts the data to network data packets. The network data packets are then passed over the network 1 to the second network device 3B. The second network device 3B may then operate to convert the network data packets back to PDA packets which can be sent from the wireless interface 7B of network device 3B to the second PDA device 9B, remote from the first PDA device 9A.

[0027] Thus, data can be transferred between PDA devices across large distances through use of the infrastructure of the network. Existing PDA wireless interfaces can be utilized. There is no need to change or adapt the PDA devices in order to enable the transfer of data.

[0028] Whilst in the preferred embodiment illustrated in FIG. 1, interface 7A is a wireless interface, the skilled person will appreciate that a serial port interface may be

utilised in accordance with the present invention. In particular, a relatively short range, serial connection may be utilised between first or second network device 3 and first or second PDA device 9, respectively.

[0029] Furthermore, the skilled person will appreciate that the configuration does not need to be symmetric, as illustrated. Rather, the first and second PDA devices may be different types of PDA devices, and the interfaces used to connect the first PDA device and the first network device, may be different from the interfaces used to connect the second PDA device and the second network device.

[0030] In accordance with a preferred embodiment, and as described below with reference to FIG. 2, the network devices 3A and 3B are LAN telephone devices.

[0031] FIG. 2 shows the method steps employed in the system shown in FIG. 1 to transfer data from PDA device 9A to PDA device 9B.

[0032] In accordance with the preferred embodiment, the present invention is implemented by software running on telephone network devices 3A and 3B shown in FIG. 1. It will be appreciated that the method of the present invention may be implemented in other forms, such as hardware.

[0033] Referring to FIG. 2, at step 10 a telephone call is first established between the first individual using telephone device 3A and the second individual using telephone device 3B across the network 1. As is well known in the art of LAN telephony, the establishment of a telephone call provides a (temporary dedicated) connection between the two telephone devices, enabling voice data packets to be exchanged without explicit addressing information, once the connection or "conduit" has been established. In accordance with the preferred embodiment, TCP/IP protocol data packets (e.g. VoIP data packets) are exchanged during the telephone conversation. In other embodiments, Ethernet data packets may be exchanged.

[0034] During the conversation, the first individual, using telephone device 3A, suggests to the second individual, using telephone device 3B, that he send certain data from his PDA device 9A to the PDA device 9B of the other individual for use. For example, the data may include directions and/or a map; contact information of mutual interest or other relevant PDA information.

[0035] Thus, at step 20, the first individual operates his PDA device 9A which transmits the selected PDA data from PDA device 9A to telephone device 3A using their respective wireless interfaces. In the preferred embodiment, the wireless interfaces are IrDA interfaces which are conventionally implemented in PDA devices such as the PalmPilot and used to link to IrDA telephone devices for speed-dial purposes using the PDA address book. The use of the existing IrDA interfaces is accordingly advantageous.

[0036] At step 30, the telephone device 3A receives the selected PDA data through the wireless interface 7A. Importantly, in the preferred embodiment, all the selected data is gathered by the telephone device 3A, before proceeding to the subsequent steps of sending data across the network 1, as described below. This ensures that if the PDA device 9A terminates the transmission of the PDA data to the telephone device 3A, which may arise if the wireless interface connection is lost, no data will be transmitted across the network 1.

[0037] At step 40, the telephone device 3A determines the format of the PDA data.

[0038] At step 50 the telephone device 3A converts the PDA data to an appropriate network protocol for communication across the network 1. More specifically, step 50 encapsulates the PDA data received at step 30 in data packets of suitable format for transmission across the network 1. In the preferred embodiment, the PDA data is encapsulated in IP data packets for transmission across the network 1. The skilled person will appreciate that the encapsulated data packets may be implemented in any network protocol which can identify the encapsulated data as PDA data. However, the preferred embodiment utilises IP, since the telephone device 3A includes an IP stack for sending IP voice packets on the network.

[0039] At step 60, the encapsulated data packets from step 50 are sent from telephone device 3A to telephone device 3B across the established connection. In particular, the data is sent as additional packets along with the existing voice packets of the telephone conversation. Advantageously, no additional addressing information is required in order to convey the data from telephone device 3A to telephone device 3B, since the call has been established at step 10.

[0040] It will be appreciated from the above that steps 30 to 60 are carried out in software running on telephone device 3A. The subsequent steps concerning the receipt of the data are carried out by software running on telephone device 3B, as will be appreciated from the following.

[0041] At step 70, the telephone device 3B receives all the data packets, sent in step 60, from the network 1.

[0042] The second individual (the recipient) now wishes to transfer the data to his PDA device 9B. In order to achieve this, he needs to operate the network device 3B to convert the network data packets (e.g. data packets in IP format) to data compatible with PDA device 9B.

[0043] Thus, at step 80, the data format used by the second PDA device is determined. The PDA data format can be determined in a number of ways. For example, the network device 3B upon receipt of the data at step 70 may send out a test transmission from its wireless interface 7B. The PDA device 9B may then respond with the relevant protocol information.

[0044] Thus, at step 90 the network device 3B converts the received network data packets to data in the appropriate PDA format.

[0045] At step 100, the network device transmits the resulting PDA data through wireless interface 7B to the second PDA device 9B.

[0046] The second individual can then access the PDA information using his PDA device 9B.

[0047] It will be appreciated that the software running on telephone device 3B may be configured to perform steps 90 and 100 automatically upon receipt of relevant network data packets, by pre-specifying the PDA protocol of the PDA device 9B. The user then need only ensure that the wireless interface of his PDA device is within the necessary physical range for communication of the data from the telephone device 3B to the PDA device 9B.

[0048] Moreover, whilst steps 20 and 30, and steps 90 and 100 are preferably performed in response to user activation, it will be appreciated that such steps could be performed automatically.

[0049] In addition to enable the transfer of PDA data from one PDA device to another PDA device over a network, the present invention may be employed to provide a PDA device with access to a network for other purposes. For example, the PDA device 9A may use a network device 3A as an access point for browsing the internet or sending and retrieving email in a similar manner to modem dial-up interfaces currently in use and well known in the art. In particular, the PDA device may run a Web Browser, and would send data to, and receive data from, the network device 3A using a relevant PDA format, for example, IP data packets in PPP (Point-to-Point Protocol) encapsulating HTML data. In accordance with the present invention, the network device 3A would convert the IP data packets, exchanged during internet browsing, between the appropriate Link Layer protocols (e.g. IEEE 802.2 and Bluetooth/IrDA/Serial RS232).

[0050] In an alternative embodiment, the network devices 3A and 3B of FIG. 1 are not telephone devices. In this case, a point-to-point connection cannot be utilized through the establishment of an IP telephone call. Accordingly, in such an embodiment, it would be necessary to register the PDA devices 9A and 9B with a server using an appropriate registration protocol. The server would register an identifier of the PDA device (e.g. a name/address) together with the network location/address at which the PDA device could send and receive information across the network (e.g. the IP address of a particular telephone device). Thus, the server would hold a directory of PDA devices and corresponding network devices.

[0051] For this alternative embodiment, the SIP protocol would be one suitable method by which registration of PDA devices could be achieved using a SIP server. A SIP application on the PDA device, or a SIP proxy on the corresponding network device, configured with the address of the SIP server and permission to register with it, would be necessary. Communications destined for a PDA device, and utilising the SIP protocol, could then be directed to the network device registered for the PDA device by the SIP server.

[0052] Whilst the described embodiment is implemented in a TCP/IP LAN networks, it will be appreciated that it may be implemented in other networks, for example, networks employing protocols such as IPX or AppleTalk.

[0053] As the skilled person will appreciate, various modifications and changes may be made to the described embodiments. It is intended to include all such variations, modifications and equivalents which fall within the spirit and scope of the present invention, as defined in the accompanying claims.

1. A method for communicating data from a Personal Digital Assistant (PDA) device over a network, the method comprising: receiving data from a PDA device in a PDA format, and converting the received data to a format suitable for transmission across the network.

2. A method as claimed in claim 1, wherein the data is received by a network device through an interface selected from the group consisting of a wireless interface and a serial interface.

3. A method as claimed in claim 1, further comprising, after the step of receiving, determining the format of the received data, and converting the data accordingly.

4. A method as claimed in claim 1, wherein the network is a LAN network, and the step of converting comprises encapsulating the data in data packets in accordance with the LAN protocols.

5. A method as claimed in claim 1, further comprising: transmitting the converted data from a first network device to a second network device across the network.

6. A method as claimed in claim 5, further comprising receiving the converted data at the second network device, and converting the data to a format suitable for transmission to a second PDA device.

7. A method as claimed in claim 6, further comprising, prior to the step of converting, determining the data format used by said second PDA device.

8. A method as claimed in claim 6, the second network device further transmitting the data to a second PDA device through an interface selected from the group consisting of a wireless interface and a serial interface.

9. A method as claimed in claim 1, wherein, prior to the step of receiving, a telephone connection is established between at least two telephone devices on the network, and wherein the step of receiving data comprises receiving data at one of the telephone devices through an interface selected from the group consisting of a wireless interface and a serial interface.

10. A method as claimed in claim 9, further comprising: transmitting the converted data from said one of the tele-

phone devices to the other of the telephone devices across the established network connection.

11. A method for communicating data to a Personal Digital Assistant (PDA) device from a network, the method comprising: receiving data from the network in a network compatible format, and, and converting the received data to a PDA format suitable for transmission to a PDA device.

12. A method as claimed in claim 11, further comprising transmitting the data from a network device to a PDA device through a wireless interface.

13. A computer readable medium including a computer program for carrying out the method as defined in claim 1.

14. A computer readable medium including a computer program for communicating data from a Personal Digital Assistant (PDA) device over a network, the program comprising: a program step for receiving data from a PDA device in a PDA format, and a program step for converting the received data to a format suitable for transmission across the network.

15. A network device configured to receive data from a PDA device in a PDA format using a short range wireless link, and configured to convert the received data to a format suitable for transmission across a network.

16. A network device as claimed in claim 15, wherein the PDA device is further configured to determine the format of the received data, and to convert the data accordingly.

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